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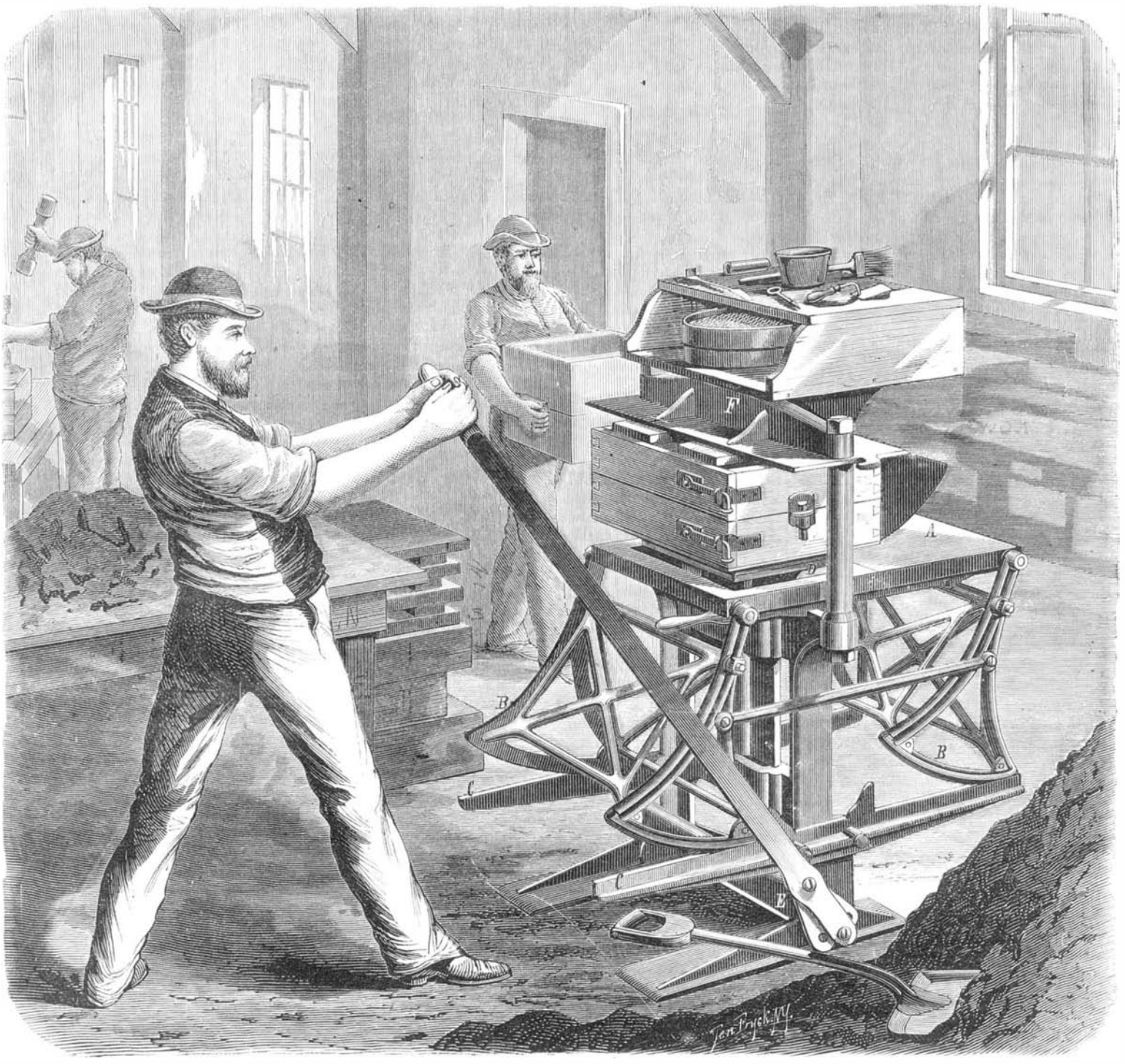

## EAMES' AND BROADMEADOW'S MACHINE FOR MOLDING METAL CASTINGS.

### MACHINE FOR MOLDING METAL CASTINGS.

The ramming of molds is an operation which not only requires care, but judgment. Care in the venting, in placing the bottom board, in the quality of the sand, is alike essential, and to this is added the exercise of a judgment which is only attained by long and watchful experience, in ramming hard at one point or soft at another, according to the nature and style of the work to be produced, or in packing the sand with the absolute uniformity, at all points, which becomes necessary in many forms of casting. Ramming, therefore, is almost an art to which a man must educate himself, and certainly not one in which a few days' or a few weeks' practice will render a previously unskilled workman proficient.

It is unneeded here to enter into any discussion regarding the obvious utility of mechanical devices which fulfil the double purpose, of on one hand superseding the fallibility of hand labor by the certain accuracy of the machine, and on the other of saving the time which otherwise would be expended in acquiring the knowledge necessary to perform the work.

We have recently returned from a visit to New Britain, Conn.,—one of those thriving manufacturing towns of New England which have sprung from the dimensions of small villages almost within memory of the present generation—where, at the factory of its manufacturers, we devoted some hours to the examination of a machine which excited in our minds an interest which will doubtless be shared in by every metal worker.

The apparatus, of which we append an excellent engraving, is one for ramming molds, and in construction is extremely simple. There is a carriage composed of a table, A, which is supported on segmental wheels, B, the latter resting on ways, C, attached to the main standard. The segments, B, are suitably connected and travel upon the same arc, so that upon them the table can be moved toward or from the workman at will In the table is an aperture through which works the rod supporting the platen, D. The upper end of the rod enters a socket in the bottom of the platen, while its lower extremity receives a projection on the vibrating cross piece, E. To the right hand end of this cross piece is secured the lever, shown in the hand of the operator, by bearing down on which, as will be evident from the connection of parts, the platen can be raised. By this means, whatever may be placed between the platen and fixed head plate, F, can be compressed as desired An adjusting screw is arranged in the platen connecting rod, by which the length of the same and consequent throw of the lever before pressure begins can be regulated, andthere is also a simple latch by which the table is locked in proper position. The operation of molding consists in first swinging the table outwards by pushing up the lever and so locking it. Then the match and pattern is laid upon the platen, and above the former, the lower half of the snap flask. Sand is first sifted upon the pattern and subsequently shoveled in until the receptacle is evenly filled. The back board is then laid on top, the latch lifted, the table swung in, and the lever pulled down. The back board is thus brought up against the head plate, forcing down the loose sand beneath it. The table is again carried outward; on the pressure being relaxed, the match is removed, the flask reversed, and the cope adjusted, sand is placed in as before, another board laid above, and the whole brought again under compression. This is the position of the machine as shown in the engraving. Again the table is swung forward, and on removing the upper board two shallow cavities, made by projections therein, are found in the sand. A hollow metal punch is forced down into these, forming the pouring holes, which, with the subsequent preparing of the mold, are finished in the usual way. The use of sprues by this means is done away with.

This sums up the construction of the machine and its working, and it now remains to point out what it will do Standing in the molding room, watch in hand, we noted the time taken by a first class molder to complete ten molds by the old process of ramming, and then to finish the same number by the aid of the apparatus. The snap flasks were 11 by 13 inches in size, and the castings $4\frac{1}{2}$ inch iron rim locks. By hand, the ten molds were completed and deposited on the floor in 39 minutes; by the machine, the same work was done in 18 minutes. The hand made molds also were fully one third heavier than those made by the apparatus.

A reference to the foreman's books also furnished us with other interesting points. A fair day's work in ramming the molds in the old way for lock castings averaged 163 pounds of metal, against 250 pounds from same patterns by the machine. Common butt hinges showed 397 pounds by machine against 260 by hand. The average saving in labor, on all kinds of work, is fully $33\frac{1}{3}$ per cent. Perhaps more striking evidence will be found in the fact that an entirely unskilled workman, on the second day of his attempting the task, completed 110 molds of about the size above noted, and another man on the fourth day made 140 molds. In the casting of small work in brass, such as keys, etc., we were told that 1,752 pieces are made in a day through the machine, against 1,008 pieces through hand labor, the reason given being the possi-

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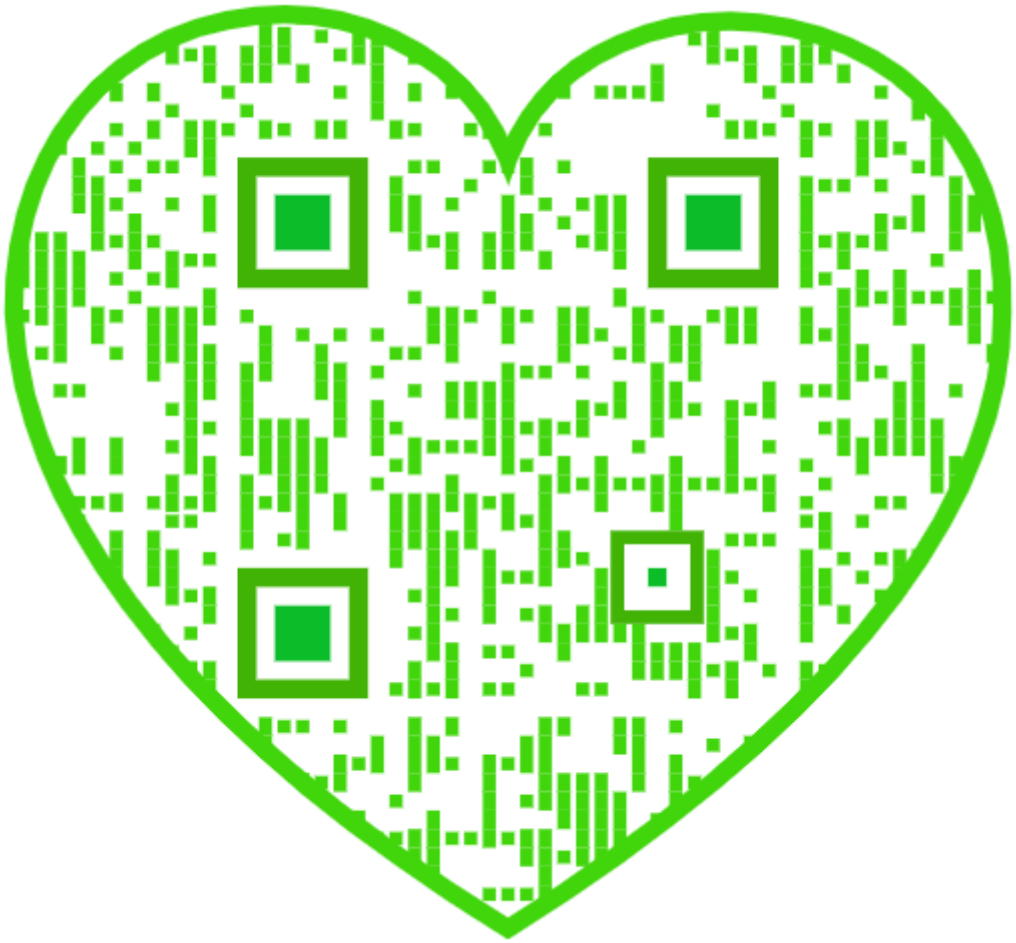

bility of putting a larger number of pieces in a flask, of making more molds, and of getting out much better work.

We may add that the specimens of castings exhibited to us, as coming directly from molds thus prepared, appeared fully as sharp and clear as those from the best hand-rammed molds. Nor does the intricacy of the pattern seem to cause any difficulty, as we were shown molds for very irregular blind hinges, and completed castings for bank locks, the latter weighing some 30 pounds each, and of considerable intricacy of form. We also remarked that, through the evenness of the ramming, the waste through imperfect casting of large numbers of keys, hooks, and similar small goods was very small, almost every object coming from the sand true in shape.

Our readers can draw their own conclusions from these simple facts, so that we forbear further comment. We examined the score or more machines which the manufacturers, Messrs. P. & F. Corbin, of New Britain, Conn., had in use in their factory, noting in every instance the ease and rapidity with which they were handled by the workmen. The amount of pressure to be applied to the lever seems to be the only point requiring practice to judge; but that this knowledge is readily acquired, is proved by the work of the unskilled hands above detailed.

The patent granted to Albert Eames and John P. Broadmeadow, of Bridgeport, Conn., under which the device is manufactured, was extended November 25, 1873, and many essential improvements are covered by another patent dated August 4, 1874. Further particulars may be obtained by addressing the manufacturers as above, who are the sole licensees for the sale of the machines.


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## OUR FEVER NESTS AND THEIR REMEDY.

Though blessed by nature with a situation unrivaled for sanitary advantages, New York has a death rate such as few cities in Christendom can equal. The appalling mortality of the past summer, especially among children, has given rise to a great amount of sorrow and indignation on the part of the daily press, and not a little severe criticism of the action of the medical and police authorities, the common theory being that the enforcement of proper sanitary regulations would have prevented the larger part of the needless loss of life. That much might have been done to improve the health of the city by more rigid sanitary measures, there is no doubt; but it is useless to expect a Board of Health, however efficient, to achieve impossibilities. The great source of disease and death in the city is the tenement house system, whereby families are massed by the hundred in huge barracks, destitute of light, ventilation, the means of keeping clean—of every appliance, in short, for healthful living; and until wholesome dwellings can be substituted for these dens of disease, New York must endure the shame of being one of the most unhealthy cities in the world. No other city, in its densest portions, crowds half as many inhabitants to the acre as can be seen in some of our lower and eastern wards, and nowhere are the dwellings so poorly fitted for a numerous occupancy. And not only are these huge hives, with narrow halls and lightless sleeping rooms, crowded from the roof to the pavement with poverty-stricken families, but underground in damp, unwholesome basements, multitudes find miserable shelter. Says the Children's Physician to one of the largest dispensaries: "An experienced dispensary physician can detect a patient who comes from a basement simply by the sense of smell"! Is it any wonder that the deaths of children in such a house number five or six a week? Or that a week of excessive heat may swell the weekly death list of children under five years of age by four or five hundred? About two thousand of these candidates for early death are born in our tenement houses every month.

With high culture, scientific management, and abundant means, it may be possible for many families to dwell together in health and safety under one roof; but where ignorance, poverty, and filthy habits prevail, the massing of families is little short of pestilential. Only by the dispersion of the tenement house population can the now over-crowded wards of the city be made tolerable, and the death rate reduced to reasonable limits; and we see no way by which such a desirable result can be effected humanely, save by providing means for carrying the poorer working people to and from country homes more rapidly and cheaply than is possible with surface roads.

To some extent it may be necessary to do for this class of the community what Mr. Stewart is doing for the more fortunate in his Garden City (a description of which was given in the SCIENTIFIC AMERICAN about a month ago), and that is to build country cottages for them.

The success that has attended the operations of the Artizans', Laborers', and General Dwellings Company, in providing cheap suburban homes for the working men of the larger English cities, is proof that such enterprizes may be profitable as well as philanthropic.

In connection with the recent inauguration of one of their villages, the London *Times* gives a detailed account of the history of this company and of the work it is doing. The new village, called Shaftesbury Park, will illustrate its mode of proceeding. The site embraces forty acres. The foundation stone was laid in August, 1872; and it is expected that, by the opening of the coming winter, 749 of the intended 1,200 dwellings will be ready for occupation. The houses are engaged long in advance of their completion, while over 1,200 applications, for houses still to be built, are on the books. The dwellings are of four distinct classes: Class 1 contains eight rooms—a front parlor with bay windows, a backroom for meals, a kitchen with dresser and kitchener, a small larder, a scullery fitted with copper and sink, a closet, ash pit, and coal cellar; while on the floor above are three bed rooms and a bath room. Class 2 are seven roomed houses, without the bath room. Class 3 have six rooms, and class 4 have five rooms, of which two are bed rooms. Gas and water are laid to every house. Ventilators are supplied to each room; and the drainage (except surface water) is carried back from the closet and sink in the rear, so that no drain passes under any house. The foundations are of concrete, and the roofs are of slate. The paths have been laid with asphalt, and shade trees have been set out. There is also a temporary lecture hall, now used as a school room. School houses will soon be built, and baths and wash houses are projected. A site is left for a cooperative store, and two acres and a half have set apart for park and playground.

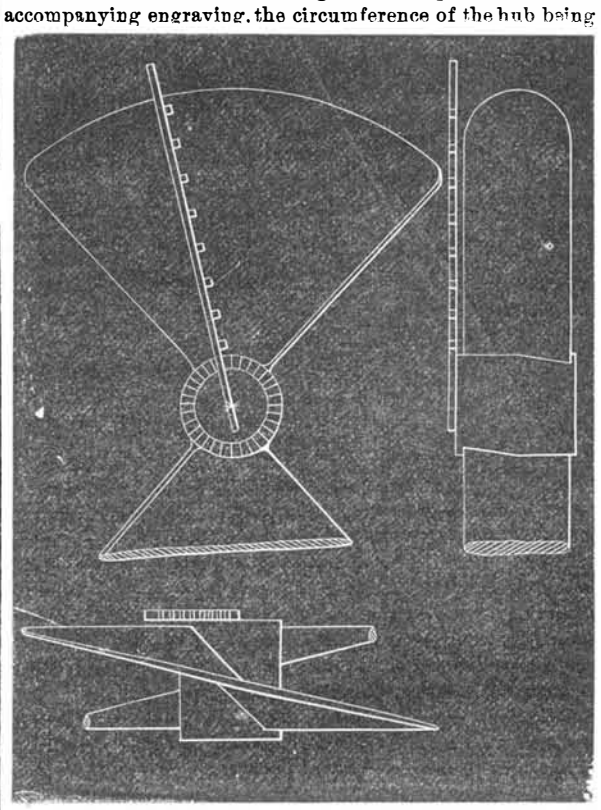
The houses have been built, to a great extent, on the cooperative system, the work being let out, under foremen in each branch, to the bricklayers, carpenters, painters, plasterers, slaters, and plumbers employed, and it is reported, as a matter of special satisfaction, that, under the piecework plan which has been adopted throughout, union and non-union workmen have worked harmoniously together, and there has been no cause for the intervention of the appointed arbitrators. Many of the workmen are shareholders in the company, and not a few of them live in the houses they have helped to build. The result of this arrangement has been unusual care in the finishing of their work. The houses built by the company, the directors say, are better than those usually erected, yet they can be sold at equally low prices, in consequence of the materials saved by the workmen, who are shareholders. It is further claimed that these interested workmen earned, by piecework, forty per cent more than their ordinary wages.

The growth of the company in popular favor is shown by the annual amount of stock taken. At the close of the first year, 1867, the share capital in hand was only $2,500; at the close of the next year it was $9,000. In 1869 it rose to $15,000. In 1870 it was $30,000. In 1871 it increased to $92,500. In 1872 it rose to $260,000, and at the end of 1873 it was $560,980. The last annual dividend was six per cent, and previously they had divided seven and a half per cent.

Were our means for cheap and speedy transit equal to those of London, villages like this might be multiplied indefinitely along the Highlands, in Westchester, and on Long Island. The advantage, not only to those who would thus be enabled to take their families into wholesome air, but to thousands who would of necessity remain within the city limits, would be incalculable.

## MEASUREMENT OF A SCREW PROPELLER.

A correspondent asks for a rule for measuring the pitch of a screw propeller. The process, though simple, requires considerable explanation to make it understood, and as the subject will doubtless be interesting to many of our readers, we devote some little space to its consideration. The surface of a screw propeller is the same as would be generated by a line revolving around a cylinder, through the axis of which it passes, and at the same time advancing along the axis. In this way the under or back surfaces of the blades may be supposed to be formed, and then the proper thickness is put on, so as to make the front or entering surfaces. All measurements of a blade should of course be made on the back surface. It will be evident, from the explanation of the manner in which the surface of a blade is formed, that by varying the shape of the generating line, or the rate of its motion along the axis, very different forms of blades can be produced. The pitch of a screw is the distance the generating line moves in the direction of the axis, while it is making one revolution around the cylinder. It is evident from this that the pitch of the screw may be constant throughout, or it it may vary from forward to after part of the blade, or from hub to periphery, according to the rate of motion of the generating line in an axial direction, and its angle of inclination to the axis. Hence in measuring a screw propeller, it will be necessary to determine the pitch at a number of points, for the purpose of ascertaining whether it is variable or constant. Every point in the generating line describes a curve which is called a helix. If measurements are taken along one of these helices, they will show whether the pitch varies from forward to after part of the blade, and measurements on corresponding points of different helices will indicate whether or not the pitch is constant from hub to periphery. As a general thing, the hub of a screw propeller is faced off at the ends, and the blades do not overhang a plane passing through this face. If necessary, however, a faced surface can be fitted to the hub, and made thick enough for its plane to clear the blades. Provide a straight edge a little longer than the radius of the propeller, and secure cleats for it, every foot of its length for large wheels, and from nine to six inches apart for small wheels. These cleats are intended to serve as guides for a rule, so that measurements can be made with accuracy at right angles to the straight edge. Secure to the end of the hub a piece of paper on which the center of the hub is marked, and the circumference is divided into any number of equal parts. Then place the straight edge on the end of the hub, bringing a mark near its end to the center of the hub, and making its direction coincide with a division of the circumference. Measure the perpendicular distance from the straight edge to the surface of the blade, at each of the cleats; then move the straight edge to coincide with the next division of the circumference, and again take measurements. The arrangement is represented in the accompanying engraving, the circumference of the hub being



divided into thirty-two equal parts. Suppose that, in the position represented, the measurements from the straight edge to the blade, taken at each cleat, are each six inches. Then move the straight edge to the next position, and suppose that the measurements are each fourteen inches. This shows that the generatrix, in one thirty-second of a revolution, has advanced eight inches in an axial direction, consequently the pitch is thirty-two times as much, or twenty-one feet and four inches. If measurements taken at successive divisions of the circumference give a successive increase of eight inches for each division, it shows that the propeller is a true screw, with a pitch of twenty-one feet and four inches. Of course, if the pitch varies, it will be shown by the variation in the difference of the measurements taken at successive divisions of the circumference. It will be observed that the measurements made at one cleat in different positions of the straight edge give determination for the pitch at different

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points of the same helix, and therefore show whether the pitch varies from forward to after part of the blade. The measurements taken at different cleats, in successive positions of the straight edge, show the pitch at corresponding points of different helices, and indicate whether the pitch varies from hub to periphery. The method here described is one of the simplest and most accurate that can be given for determining the pitch of a screw propeller. The other measurements, the diameter of the screw, length of blade, dimensions of hub, and fraction of pitch employed, are so simple as to need no explanation.

## CRIME EPIDEMICS.

The discussion of Professor Huxley's views, developing the idea of "conscious mechanism" as explaining the various forms of human action, coupled with that of Dr. Hammond's theory of "morbid impulse," the kinship of which to the former hypothesis—indeed, the fact that it is but a corollary of the same—we have already pointed out, leads to some curious speculation relative to what extent the conscious machinery of one person may be set in motion, so to speak, by the activity of that of another individual. In other words, we are led to regard not merely the direct influence which one being exerts over another, through sentiments of respect, through intimidation, or through a score of other easily suggested conditions, but that indirect influence which is termed "force of example," that power which impels one man to do as another does, although the compelling cause of, (to illustrate) gain, revenge, or desire to benefit may be totally absent—irrational imitation, if we may use the term.

Abundant instances of this are to be found in the actions of the lower animals—sheep blindly following the bell wether, parrots imitating speech, monkeys repeating motions, and mocking birds sounds, and the inclination of the horse to race, will readily suggest themselves as cases in point. More striking still is the development of the peculiarity in children, shown not only in their learning to talk, but in their every action, even their plays being but endless imitation; and thus we are led up to the faculty in the man, which may impel him, with equal facility, to the commission of every crime in the decalogue, or to the re-writing of somebody else's poetry, after the fashion of the multiple only original authors of "Betsey and I are out," and "Beautiful Snow."

The serious aspect of the phenomena to which we allude, however, is one which those who make a science of the prevention of crime must eventually take into earnest and thoughtful consideration. It certainly is a fact that crime propagates itself by infection as surely as does disease. "There is a large class of minds," says Dr. Charles Elam, in "A Physician's Problems," on which great crimes exert a kind of fascination; and those who have never trained themselves to exercise the responsibilities of moral freedom are liable to become victims of the strongest delusions, and catch easily at the moral infection which is always lurking, and sometimes raging, in the atmosphere of the world." Nor need we seek long for illustration. The prevalence of the species of highway robbery known as garotting, in New York some years since, may be recalled, and the crime found plenty of imitators throughout the country. Not many months ago, murder appeared to be rife, and hardly a daily journal could be glanced over without the eye encountering horrible details of the killing of some human being. It is a suggestive fact that the last census, compiled when the Ring in this city was in the full tide of its power, and when such a thing as honesty was rarely to be found in the persons of the ruling men, shows a ratio of crime in New York State far ahead of that in any other State of the Union. Many will recall how common defalcations in banks and other institutions of trust have been during the last year or so, these crimes being, in the majority of cases, committed by men for whose action it was difficult even to assign a motive. Attempted frauds upon insurance companies have also found repeated occurrence of late; cases of suicide have happened, again and again, under conditions strangely similar; and thus we might go on, multiplying example after example.

The cause of this state of the mind, which renders it not only receptive to outside influence, but forces it to act in accordance with the same, is difficult to apprehend. If we attempt to trace a theory in accordance with Huxley's views, we must believe that the particles of brain matter are disarranged slightly by the individual's first impressions of the crime. A second impression causes more disarrangements, influencing, besides, those faculties which impel us to recoil from such subjects—causing a dulling of the sensibilities, or a familiarizing of one with the ghastly details; a third results in a still greater and similar effect, until finally the mechanism between brain and muscle is set in motion, and the person commits the deed. The theory leads to morbid impulse again, and, besides, to another class of actions, exemplified in the deliberate planning of the details of a defalcation, which, from the very period of time necessary for their development, preclude the idea of sudden or impulsive performance. Whether the reader may choose to adopt so material a view as this, or may cling to the opinion that the mental and moral forces of the body are only taken from our self-control by some intrinsically perceptible foreign agent, such as intemperance or connection through evil counsel, and hence flatly deny the primary principle that body and mind may be so constituted as to negative the efforts of the unfortunate person to obey moral and civil law, matters little in the face of the fact that the crime epidemic exist and social science must find a way to meet it. We must look deeper, in short, for the causes of crime. If society makes murderers and thieves through its example, then should it punish them for its own misdeeds? Is the person who suggests the crime to be the avenger? Is a man amenable to punishment because his brain is beyond his control, under one theory, or because he has not the moral vigor to repel the crime disease, under the other? How is discrimination to be made, on the other hand, between him who wilfully and maliciously sins, and him who falls through cerebral weakness? If education is a safeguard—and it doubtless is, in great measure—against crime, then if society fails to compel its members to assume that protection, who should be punished for the neglect? These are perplexing questions, posed somewhat at random, it is true, but nevertheless the legitimate offspring of psychological fact, which leaves us without a doubt that prevention of crime is to be sought for rather than means for its cure. "It is very evident," says the last report of the New York Prison Association, now before us, "that society is wrong in its philosophy or practice, most likely in both. For if the theory be wrong, the practice is wrong. It is therefore clear that an intelligent application of remedies makes a knowledge of causes imperative. We have no well defined, accepted theories of the causes, degrees, and penalties for the violation of the civil code. Until we attain a true theory, our work must often blunder and often fail. How much is due to constitutional organization, and how much to the influence of society, we have failed to determine, *because of our ignorance of causes.*"

## THE COMMISSIONERSHIP OF PATENTS.

We learn that General M. D. Leggett, the present Commissioner of Patents, is about to resign the office, and that he is to be succeeded by the now assistant commissioner, the Hon. J. M. Thacher.

We much regret that the country is to lose the services of General Leggett, who has labored indefatigably, from the hour he took office, to improve the working of the department. For the most part, his labors have been crowned with success.

But some of his rulings and decisions have been variable and peculiar, especially on questions of patentable novelty. At times, he has pronounced the most broad and liberal opinions in respect to the rights of inventors to receive patents, but they have been followed by recantations or reversals of these opinions. For example, in the case of the applicant for a patent for a knitted tobacco pouch, package, or sack, that is to say, merely a section of a stocking leg, he held, on the appeal to him in person from the Board of Appeals, that the Board was in error in deciding adversely to the applicant, and ordered a patent to issue. He said: "That the sack, for the use contemplated, is a new and superior one is clear, and it is the object of the law to promote the production of new and improved articles, for the use of the public. Very little analogy appears between a stocking or purse and a sack for a tobacco package. The principles controlling the case were clearly stated by Justice Blatchford, in Strong *vs.* Noble"—whip case. After this clear and excellent decision, the applicant, having omitted payment of the second government fee, was obliged to renew his application, when the examiner again rejected the case, giving a new reference, similar in character to those previously presented, which had been overruled by the Commissioner. But General Leggett, instead of maintaining the excellent decision first given, now went back on himself, and denied the patent.

In the case of Professor Hedrick, so long and favorably known as examiner-in-chief of chemical inventions, whose established policy was to grant patents where the case by any possibility admitted of the grant, Commissioner Leggett long maintained and approved that policy. But he has lately gone back on Professor Hedrick, removed him from his original position, and substituted an examiner whose policy in granting patents is diametrically opposed to the practice of Professor H. The new examiner has made some very stupid decisions, which, if continued, will be very likely to give so much dissatisfaction as to cause his removal. Both commissioners and examiners at the Patent Office should remember that the chief object of their employment is to *grant patents*, not to reject them. They should study out every possible way to encourage and assist the inventor, and allow claims upon every possible point of novelty, however small. This is the true and reliable policy, and the only one that can give permanent or general satisfaction. It is far better to err in favor of the inventor than against him.

Should Mr. Thacher become the Commissioner, as we are led to expect, he will have an opportunity of carrying into practice some of the advanced views by him enunciated in his address before the Vienna Patent Congress last year. He there expounded the necessity of the most liberal practice in the grant of patents, and went so far as to declare that they were to be considered as the simple recognitions of that right of property in the productions of the mind, which God Almighty had himself bestowed upon man. We hope that, during Mr. Thacher's official term, he will see to it that no narrowminded examiner is suffered to remain who takes it upon himself to deprive an inventor of his heaven-born rights, no matter how small the degree of the invention.

The foregoing comments upon one branch of Commissioner Leggett's administration are not made by us in any spirit of fault-finding, but simply for the benefit of his successor in office, whoever that person may be. It can be justly said of Commissioner Leggett's administration that, as a whole, it has been a splendid one. He has been an honest and faithful officer. He has inaugurated many noble reforms, and he will leave the Patent Office in a better condition of efficiency and usefulness than it ever before reached. At another time, we shall take occasion to particularize some of the many excellent improvements that are due to his assiduous labors. We will now mention but two of them, namely, the production of the weekly *Official Gazette*, and the printing of the patents in popular form. The successful inauguration of this last named enterprize is an honor of which General Leggett may well be proud, and it will always redound to his credit. It is a benefit to the country, of incalculable value.

## INFLUENCE OF THE PRICE OF COAL ON SHIP BUILDING.

Of late years, the competition between steamers and sailing vessels has threatened to end in a losing struggle for existence on the part of the latter. The sudden jump in the price of coal in Great Britain, however, seems to have turned the tide once more in their favor.

The change is specially shown in the ship yards of the Clyde. In 1868, the number of sailing vessels built at this center of the trade was 108, aggregating 79,346 tuns, against 100 steamers of 87,000 tuns. In 1869, the sailing vessels numbered 104, of 89,150 tuns, while the steamers were 96, of 85,600 tuns. The next year, 1870, marks the beginning of the decadence in the building of sailing vessels, the number launched falling to 62, with a tunnage of 38,870 tuns, the number of steam vessels rising to 121, of 133,000 tuns.

The year 1871 showed a still further decline in the building of sailing vessels, the total being 25, of 12,720 tuns, against 170 steamers of 180,000 tuns.

In 1872, the tunnage of new sailing vessels fell to one fifteenth of that of the steamers, the ratio being 24, of 14,500 tuns, to 161, of 215,000 tuns.

Last year, the number of sailing vessels launched was about the same, but the ships were of a larger class, twelve being foreign trading vessels, and thirteen, small coasters; in all 25, aggregating 21,050 tuns.

The price of coal went up toward the close of the year, and the effect on the character of the ships called for has been remarkable. The returns for the first six months of the current year (1874) show that of 93 vessels launched, 25, of 30,000 tuns, were sailing vessels, and 68, of 99,500 tuns, were steamers. In July, the launches were equal, 5 sailing vessels, of 6,800 tuns, and 5 steamers, of 8,580 tuns. Returns are also in hand for the first half of August, and show 6 sailing vessels, of 7,010 tuns, against one small steamer, of 150 tuns, for the coasting trade.

The sailing vessels for this year are thus four times greater in tunnage than for the corresponding period during teh three preceding years, while the steam vessels show a decrease, during the same period, of 40,000 tuns.

## PECULIAR PEOPLE.

Consistency is a jewel. The orthodox journals of England have scarcely ceased to denounce the "prayer test" suggested by Dr. Thompson and introduced by Professor Tyndall, working themselves into a fever of pious horror at the bare suggestion of a doubt of the efficacy of prayer as a sanitary agent, when they join, with equal unanimity, in denouncing Baron Pigott for declining to condemn a man who sincerely trusted to prayer for the restoration of his sick child.

There is, in England, a religious sect calling themselves "the peculiar people," one of whose peculiarities is that, in a nation of Bible worshippers, they accept its teachings as their rule of life. Nothing can be plainer, for example, than the directions there given for the treatment of the sick—to call in the elders of the church and let them pray over him, anointing him with oil, "and the prayer of faith shall save the sick, and the Lord shall raise him up, and, if he have committed sins, they shall be forgiven him."

It is the practice of "the peculiar people" to follow these directions literally, much to the scandal of their pious neighbors, whose belief is tempered by a superior trust in the doctor

A short time ago, the child of one Thomas Hines was taken sick. He was prayed over and anointed, and the Lord did not raise him up. At the coroner's inquest it was testified that the child was nursed with great tenderness and fed with the best of food; but no physician was called in, for which omission a verdict of culpable neglect was rendered, and the father was sent to the criminal court, to answer to the charge of manslaughter.

In view of the man's religious convictions and the fact that he had done everything for the good of the child according to his lights, the judge refused to let the case go to the jury. Against this decision the popular protest is loud and severe, the direst consequences being anticipated, if such literal applications of Scripture texts, by the ignorant and superstitious, are to be allowed.

It is instructive to turn over the files of the papers, now so indignant at the judge's ruling, and note the different tone of their utterances at the time when the efficacy of prayer was questioned. Then it was blasphemous to doubt the sure force of the believer's petition; now it is criminal to trust to it!

Has Dr. Thompson's proposition wrought its logical effect? Or are these would-be leaders of public opinion incompetent of feeling the force of logic?

THE boiler of a thrashing machine engine lately exploded at St. Paul, Minn., killing three persons instantly, and injuring three others. One of the latter was blown 400 feet from the spot, and subsequently died.

MR. M. FLURSHEIM requests us to state that the length of the boiler mentioned in his letter (published on page 120, Vol XXXI.) should be 3 or 4 feet, and not ¾ foot, as printed.

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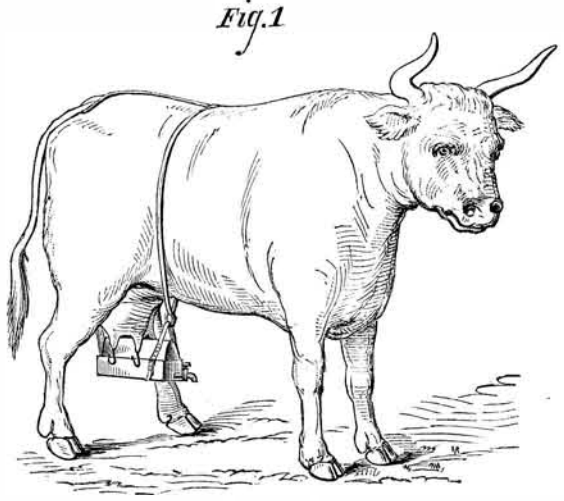
## THE AUTOMATIC COW MILKER.

A correspondent of ours, in making some researches in the Patent Office recently, stumbled across an old device among the forfeited applications, which appears to be an automatic cow milker. From sketches furnished us, we have prepared the annexed engravings, showing the invention as applied to the animal and, separately, in section.

About all that is necessary is to insert two tubes into the teats, through which the milk flows into a receptacle strapped under the udder. The vessel and the cow are to be permanent companions, for the present antique method of milking s no longer required. No longer will the horny palms of he aged agriculturist irritate the tender members of the patent brute, in vain endeavors to elicit milk which is not

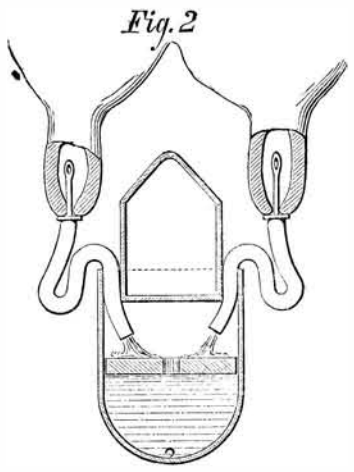
Fig. 1



there; no longer will his mellifluous accents be heard requesting her in winning tones to "come down," nor will the atmosphere of the barnyard vibrate with his wild imprecations when injured female dignity stirs up the well filled bucket with her hoof. When milking time arrives, a pail receives, from the opened faucet, the contents of the vessel, which is thus drawn off as easily as water from a cooler.

An irresponsible person, connected with this office, suggests that cows, provided with the device, might be driven by milkmen to their customers' doors, and the milk removed as wanted; and further that, by setting a dog after the animal, she might be induced to get up sufficient motion to churn the milk into butter. We have called the attention of the health authorities to the dangerous ignorance of our employee; for should he ever embark in the milk business, his erroneous views might lead him to supply the lacteal fluid in an unchalked and undiluted state to his customers, and so to produce widespread disease. Any inventor, however, who will find a way of combining a neat water reservoir and pump with this apparatus, will doubtless find his invention

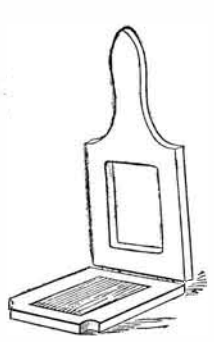
Fig. 2



vastly appreciated by the average New York milkman. A little ingenuity, we think, could devise a kind of treadmill, to be worked by the cow, to operate a pump handle.

## ENAMELED AND EMBOSSED PHOTOGRAPHS.

Take a piece of clear glass, free from bubbles or scratches, and clean it by immersing in a solution of concentrated potash over night. Wash thoroughly in clean water, and immerse for a few minutes in a mixture of nitric acid and water, one part of acid to three of water; let dry from the acid without washing. Now coat your plate with the following: Plain collodion one ounce, glycerin half a dram, and let dry. Then take sheet gelatin and soak it in cold water until it is soft; then put it in a cream pitcher or a wide-mouthed bottle, and cover with water. Dissolve the gelatin by heat, immerse your print in this warm gelatin, and lay it face downward on the collodionized plate, carefully pressing out all air bubbles; now cement with gelatin a piece of thin Bristol board, previously dampened to make it pliable, to the back of your print. Let dry thoroughly, and loosen the edges with a knife blade, by running around the glass between the print and the glass, when the whole thing will leave the glass with a very superior polish; it is now ready for pressing in Ormsby's cameo press, the simplest, most practical, and cheapest cameo press ever invented. Any carpenter will make one for about three dollars. The press and process are free

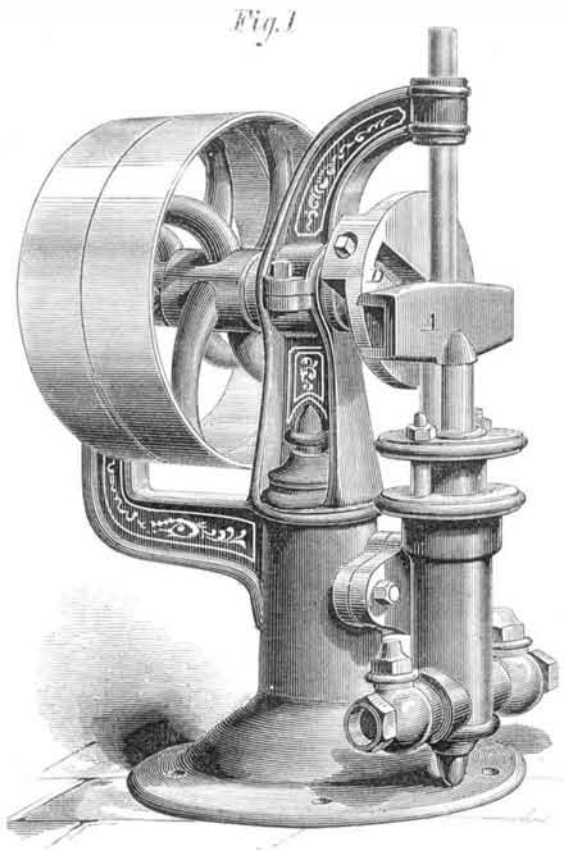


for the use of the fraternity. This process is superior to any. Where rubber is used in the collodion, they will never crack in the pressing; and where the rubber gives less polish than collodion alone, the addition of glycerin gives an extra polish. I enclose you a photograph of my press. It is made of maple wood, three quarter inch thick. The raised center for molding is glued on. The top and bottom are hinged together.—*E. D. Ormsby, in Philadelphia Photographer.*

## WORSWICK'S IMPROVED PUMP MECHANISM.

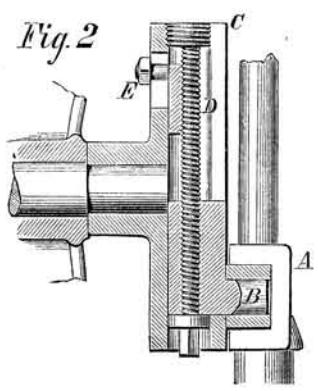
We illustrate herewith an ingenious device for converting motion, arranged in connection with a pump. It seems to do away with countershafting and other connections, thus materially decreasing the cost of the machinery, while it renders the latter easier to set up. It is adapted to almost any position, and is entirely free from any complication in its working parts. As applied to a pump, as will readily be perceived from the following description, it insures a nice adjustment of the stroke, so that a regular supply of water can always be obtained. This is an advantage of importance, as it is scarcely necessary for us to point out that an irregular feed is alike fatal to uniform pressure of steam and economy of fuel.

Fig. 1



The entire machine is shown in perspective in Fig. 1; the sectional view, Fig. 2, will aid to obtaining a clear comprehension of the essential features of the mechanism. The pump plunger has a slotted cross arm or yoke, A, in the slot of which works the wrist pin, B. This, as the head, C (fixed axially on the driving shaft), revolves, causes a reciprocating movement of the plunger. The wrist pin is attached to a slide which is adjusted in the diametrical slot, in head, C, by means of a screw, D, passing through it, so that the distance between the wrist pin and shaft or axis may be increased or diminished at pleasure and the throw of the plunger correspondingly regulated. A stop, E, is provided for the pin, B, which is adjustable by a nut screwed on a stem, projecting through a slot in the wrist pin plate. The position of this stop piece indicates the adjustment of the pin, B, for running the pump. The pin may, however, be adjusted out-

Fig. 2



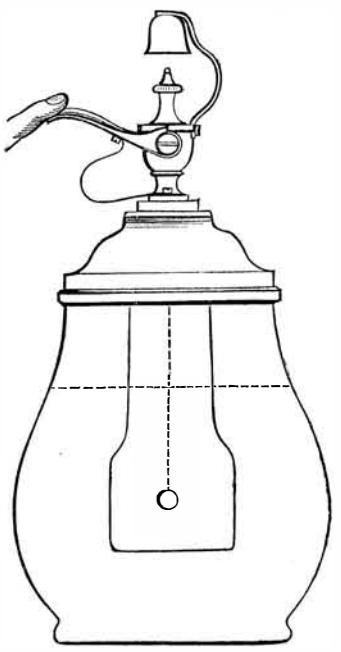

ward from the driving shaft to increase the throw of stroke of the plunger. When it is adjusted back in contact with the stop, the action goes on as before, so that the stop saves the time and labor which would be otherwise carelessly expended at every change of the adjustment of the wrist pin.

Patented through the Scientific American Patent Agency, June 9, 1874. For further particulars address the inventor, Mr. Thomas Worswick, Guelph, Ontario, Canada. Pumps thus fitted may be obtained of Messrs. W. L. Chase & Co., 95 and 97 Liberty street, New York city, or of the Armstrong Heater Manufacturing Company, Toledo, Ohio.

THE total number of complete patents issued in England, during the last year, was 2,906. In the United States, 12,864 patents were issued during the same period.

## MULLER'S NON-EXPLOSIVE SELF-LIGHTER.

The annexed diagram represents an improved form of the Döbereiner or hydrogen lamp, a well known and useful apparatus in every chemical laboratory. The reservoir is filled with water acidulated with sulphuric acid, and a piece of zinc, inclosed in a bottomless tube, is lowered therein. The hydrogen thus generated rises through the tube, and, when the stopcock is pressed down, escapes from a small orifice above, and comes in contact with a fragment of spongy platinum held in the small bell shown. The platinum is thus caused to become highly heated and to ignite the gas jet. The improvements which this device offers over the ordinary lamp

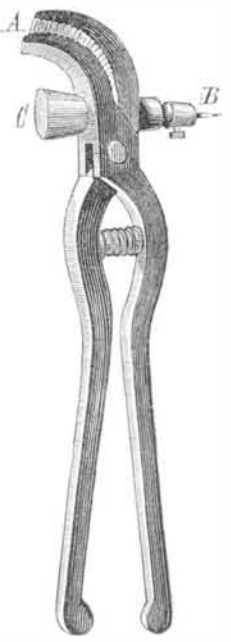


consist in the vertical channel through which the hydrogen passes. When, as is usually the case, the gas is forced to turn into a horizontal outlet, the small particles of sulphuric acid, which are carried up, accumulate in the passage, corroding the metal and preventing a free escape of the gas. By having the whole channel in a vertical position, the acid will readily flow back to its reservoir.

By securing the spongy platinum within a suspended bell it is covered and protected from injury. A working model of this invention can be seen at the office of the American School Apparatus Company, No. 21 John street, N. Y. For further particulars address the owner of the patent, Mr. Joseph Hertford, P. O. Box 998, New York city.

## SHOEMAKERS' COMBINATION TOOL.

By means of the ingenious contrivance represented in our illustration, the shoemaker is enabled to draw the upper of his work into place, pierce a hole for the peg, and drive the latter home, all without once laying down the tool. This is accomplished as follows: The upper is grasped between the curved jaws of the pinchers, A, and pulled into position. The instrument is then reversed while being raised, and, by a blow, as if with a hammer, the awl portion, B, is driven into the leather. A peg, taken from the mouth, is inserted in the hole, and the tool once more reversed. Lastly, a stroke from the hammer, C, forces the peg into place.




In this way the lasting of the shoe may be finished with considerable rapidity, and consequent economy of time and labor.

The device was recently patented through the Scientific American Patent Agency, by Mr. Joseph F. Ober, of Mount Desert, Maine.

## Surgical Freezing.

The successful employment of an anæsthetic which prevents pain without destroying consciousness is a matter of interest and importance to medical people everywhere. Dr. B. W. Richardson, in the London *Lancet*, describes two operations of this kind, by him performed, for removal of cancerous tumors of the breast, both patients being ladies. A spray of common ether was directed upon the tumor until thoroughly chilled. The lighter fluid, a compound of ether with hydride of amyl, specific gravity 0·720, was then applied until the whole of the breast was frozen like a snowball. Instead of with a scalpel, the incisions and removal were effected by means of small, strong, sharp, and curved scissors. The use of this instrument is considered essential. The operations were successful, the healing speedy, without discharge or trouble of any kind.

AN EIGHTEEN INCH RAILWAY.—The narrow gage tramway, laid down along most of the avenues of the Royal Arsenal, Woolwich, has proved so completely successful that it has been decided to introduce the system at the new works at Chatham The gage is only 18 inches.

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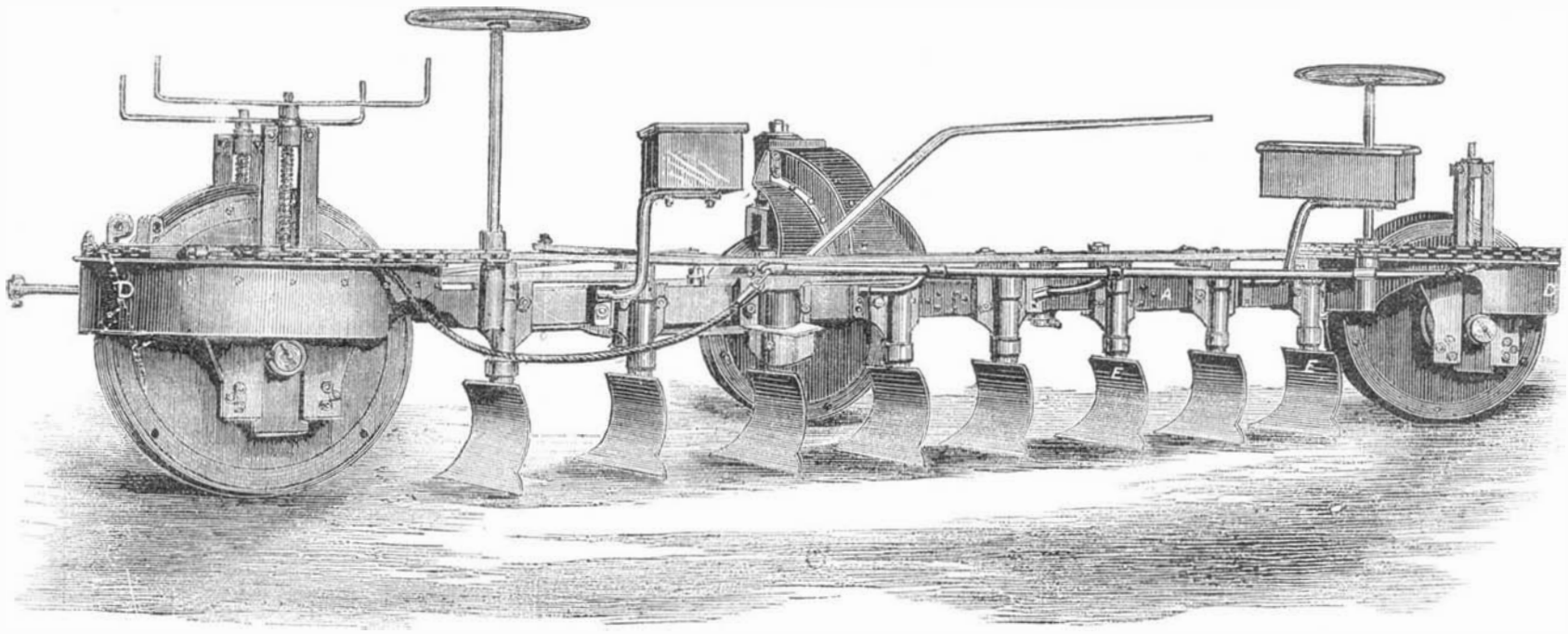
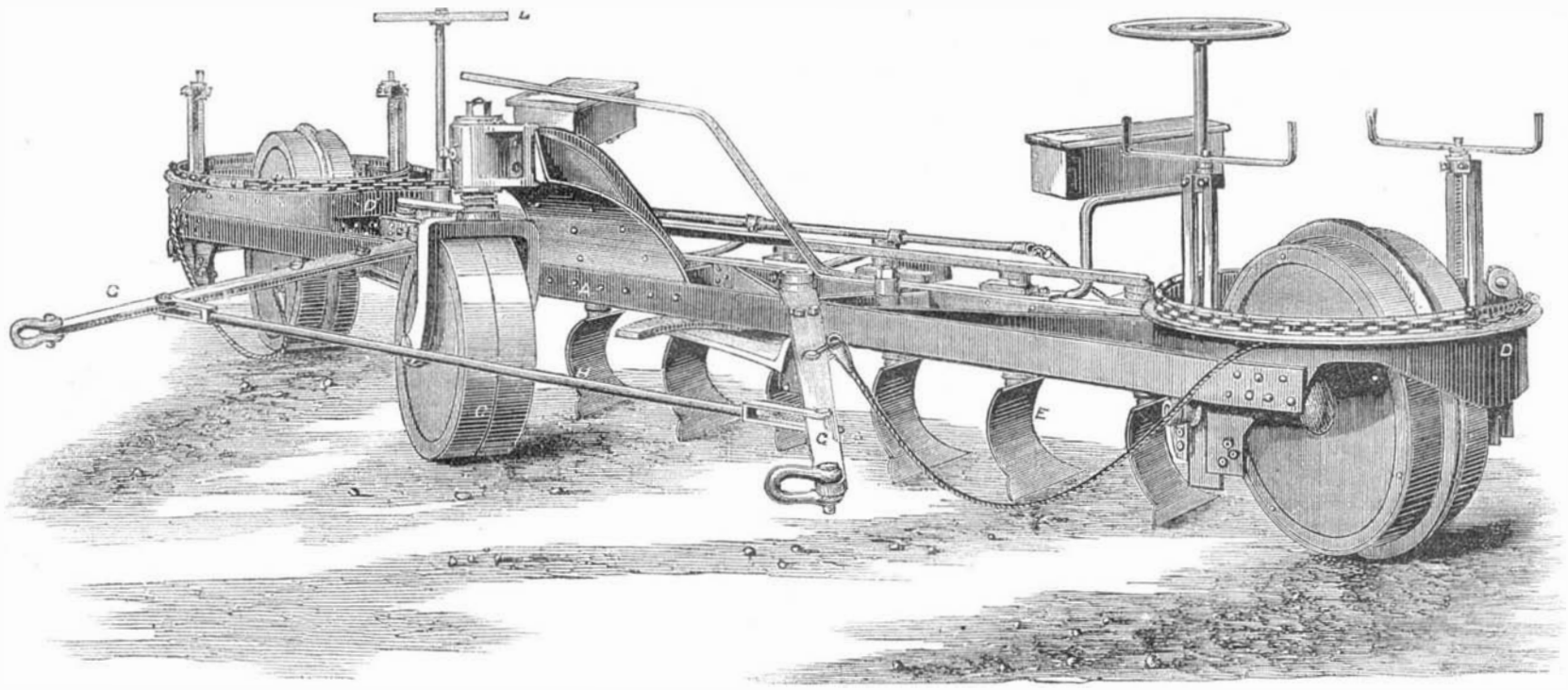
## NEW STEAM PLOWS.

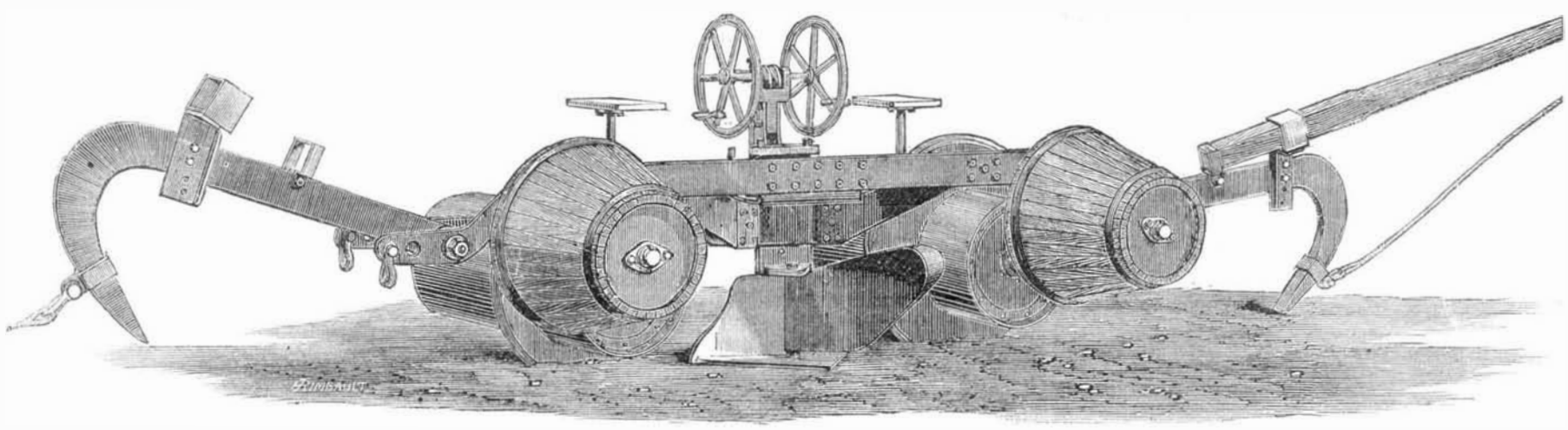
The steam plow problem has, for many years, occupied the attention of farmers and makers of agricultural implements in England; and the various designs which have achieved success have more or less embodied the original John Fowler plan of a gang plow drawn from end to end of the field by an engine operating a hauling drum and a rope. We give herewith (extracted from *The Engineer*) two views of an improved plow, designed by Messrs. Greig and Eyth, to meet a difficulty found in using the first Fowler plow, which was unsteady in action except in subsoil plowing. Messrs. Greig and Eyth's model is claimed to be especially useful when not deep cultivation but only competition with horse power is the object.




GREIG AND EYTH'S STEAM PLOW.

The longitudinal horizontal main frame, A, to which the plows are attached, stands on three wheels, of which the middle one, C, is a caster wheel, while the two end wheels revolve in turntables, D D. These turntables are so contrived that they lift or lower the main frame exactly by the depth of the furrow, according to the direction which is given to the wheel. The wrought iron plow skifes, E E, are fixed in sockets, in which they can turn, being connected among themselves by a long rod, F, working short levers, so that the relative position among themselves is always the same, and that the turning round of one plow causes all the others to turn as well. There are, further, two horizontal pulling levers, G G, connected by a rod, H, to which the two rope ends are attached. One of them works a toothed segment, hidden by the framing in our engravings, above which a circular plain segment is fixed. The former gears into a corresponding segment, fixed to the nearest plow skife; the latter corresponds to a peculiarly shaped disk, also firmly attached to this skife. In turning the pulling levers either backward or forward, the toothed segment not only turns the plows completely round, but the disk causes them also to be firmly locked., while the levers in their two extreme positions are still free to swing about through a considerable angle. These levers are also connected, by wire ropes and other suitable tackle, to the turning rings of the turntables, which, among themselves, are connected in a similar manner, so that the turning of the levers turns also the two end wheels into suitable positions. The plows themselves are of a peculiar shape, the share being shaped so as to cut with either end, while the short hollow moldboard, E, throws the ground completely over towards the same side, whether it goes backwards or forwards. While at work the main frame travels in a slanting position over the land, the front wheel running in the preceding furrow, the hind wheel on the unplowed ground, the plowman steering the furrow wheel at I, or K. This position is readily maintained, as the pull passes through the center of the resistance of the plows. At the headland the levers are turned by the second engine beginning to work, and turn first the single plows at the same time as the two end wheels are turned square to the main frame. One end of the frame moves now along the headland, so that the slanting position of the whole is reversed, whereupon the implement proceeds on its back journey These plows are intended to work to a depth varying from 3 inches to 5 inches only, but will turn over eight to twelve furrows, or a width of 8 feet to 12 feet, at a time. Nevertheless, in going from field to field, the implement will take no more space than a width of 4 feet to 5 feet. In turning round at the field ends, it is perfectly self-acting, giving no trouble whatever to the plowman, and producing very short headlands and clean straight ends, while, when at work, it rigidly keeps to the proper depth for which it is set.



THE SUTHERLAND STEAM PLOW.

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Another entirely different form of plow, also constructed by John Fowler & Co., has lately been introduced on the Duke of Sutherland's vast reclamation works in his own country in the North of Scotland. A track of land was cleared (the roots of trees being dragged out by steam engines), plowed, and drained with stone and pipe drains. The plow (of which we give a view, copied from *Engineering*), which has been brought to its present state by successive improvements, may be described as an iron frame, about 10 feet long and 18 inches wide, supported upon six wheels or rollers, and bestridden by the plowman who guides it. Two of the rollers are underneath or within the frame, two are outside of it towards the plowed land, and two are outside of it towards that which is still untouched. The plow is so constructed as to work in both directions, backwards and forwards, without turning, and all its parts are double, except the mold board, which is made to turn upon a hinge, and thus to face either way. Below the center is a strong flat coulter, presenting a sharp point and a concave cutting edge towards each end of the frame, and to the center of this coulter the mold board is hinged. Just beyond the coulter, both fore and aft, there is a flat iron disk, about a yard in diameter, with a cutting edge, and turning freely on a horizontal axis transverse to the frame; and on either side of each disk there is a broad iron wheel or roller, 2 feet in diameter. On the side towards the land as yet unturned these rollers are 2 feet 6 inches broad, and are external to the frame; and on the side towards the furrow they are 18 inches broad, and, together with the disks, are contained within the sides of the frame. The disks rotate on the same axes as these internal rollers, but can be rendered more or less eccentric with regard to them; so that the depth of penetration of the disks can be regulated at will, and may vary from 4 inches to 15 inches. External to the frame on the other side, toward the plowed ground, are two broad wooden rollers, about 2 feet 6 inches in diameter. At each end of the frame its lateral pieces are united by a strong transverse iron bar, which also passes through, and serves as a pivot for, the end of an iron shaft about 6 feet long, which terminates in a large, boldly curved hook, having its point shod with steel. To the nose of this hook is attached an iron ring, and a rod to serve as a traction bar, to which the wire rope of the engine is made fast; while on the top part of the shaft there are two collars to receive one end of a long wooden lever, the other end of which is attached to the wire rope at the trailing end of the plow, and which depresses that hook and forces its point deeply into the soil, while the point of the leading hook is lifted out of the ground by the traction of the engine. Above the center of the frame there is a seat for the plowman, and a simple steering apparatus by which any desired direction may be given to the axles of the disk and of the iron wheels, so as to guide the course of the plow. The traction force is supplied by two steam engines, each of 16 horse power nominal, and working up to about 40. They are furnished with broad wheels, so as to be supported and to move easily on soft ground, and each carries the necessary length of wire rope on a horizontal drum situated beneath the boiler. They are found to work most advantageously when placed about 400 yards apart. Under ordinary circumstances, the plow completes its course of 400 yards in a quarter of an hour. When it reaches the hauling engine the lever is shifted to the other hook, a slight change is made in the steering wheel, and, in about a minute, the other engine takes up the work, and the plow is dragged back again. It traverses both sudden hollows and sharp ascents without losing its hold of the soil, which it penetrates to a depth of from 13 inches to 20 inches; and, although it rolls and flounders over the many hidden obstacles in its way, and gives an uneasy seat to its rider, it seems incapable of being upset. When any impediment is encountered, such as a huge stone or firmly bedded root, the disk acts the part of a wheel, and, no longer cutting its way, lifts the plow bodily over the obstacle, while the trailing hook, in most cases, gets its point underneath it, and tears the stone or root out of the ground.

When the leading disk rises over a stone or other impediment, the point of the trailing hook is buried more deeply than before, and thus very large roots, and masses of stone measuring a cubic foot and sometimes much more, are dragged out and left upon the surface by the action of the plow alone. If the hook does not obtain sufficient hold, the stone or root is somewhat cleared by hand, and a chain is cast around it. When the plow next passes, the chain is made fast to the rope, and in this manner very considerable boulders have been dragged out of the ground and carried away. Sometimes, however, a stone or root is too large, or too firmly fixed, to be so dislodged, and then recourse is had to blasting by dynamite, which has been employed with perfect safety, and has never been found to fail.

Both these plows were exhibited at the recent Royal Agricultural Show at Bedford, England, and attracted much attention.

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AMONG the recently patented novelties is a method of mending cracked church bells, so as perfectly to restore their tone. It is done by introducing a furnace within the bell, to warm up and fuse the edges of the crack, at the same time pouring in new metal enough to fill out the crack, the sides of the bell being covered with plates to prevent escape of molten metal.

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A BOAT RACE between E. Morris, of Pittsburgh, Pa., and G. Brown, of Halifax, N. S., took place at St. John's, N. B., on September 26. The course was five miles long, on the Kennebecasis. Brown was the victor by only two lengths. Time, 37 minutes.

## Correspondence.

### A Practical Mechanic at the American Institute Fair.

*To the Editor of the Scientific American:*

In the machinery department, in which there is a much larger and finer display than usual, one is at once surprised at the din caused by the numerous practical operations being carried on, and especially so at the clang and jar caused by a large gear wheel on one of the air compressors, which wheel has two rows of teeth in the one casting, the teeth of one row being opposite to those of the other instead of the one opposite to the spaces of the other, as should be the case. In addition to this defect, there is considerable backlash or play between the teeth of the driving pinion and the wheel, producing a rumble and an occasional "pound" only equaled by the Blake stone crusher. One would have thought that inserted wooden teeth would have been employed rather than that such a clatter should be made by an exhibited machine. The compressor, it is true, is not doing any duty, and is doubtless more noisy than it would be under its load; but creditable as a piece of workmanship it never can be, under the most favorable circumstances, until that wheel is removed and a better one substituted.

The two engines driving the machinery are very creditable specimens of workmanship, although there are wide variations between the two in matters of detail. The Wright engine has the lugs of its eccentric straps open a quarter of an inch, so that they are not locked together by the bolts at all, and merely hang, as it were, on the eccentric; they are the only ones in the Fair possessing this defect. The connecting rod of this engine has solid boxes instead of straps, being in this respect similar to the side rods used on English locomotives; such rods are not only less expensive to make, but are easier to repair and less liable to suffer from wear. The joint faces of the brasses are, however, left open, instead of being fitted "brass and brass," as they should be; this defect exists in nearly every connecting rod exhibited, the Baxter and the Shapley engines being honorable exceptions. If one asks why such joints are left open, the reply is "well it don't ought to be, I know, but—but they all seem to do it." The movement of a small connecting rod on this engine cannot fail to attract attention; it is about ten inches long and connects one end of the rocker arm to the arm of the shaft working the cut-off, the movement of each end of the rod being part of the circumference of a circle, the plane of one circle being at right angles to the plane of the other, and said rod having the bore of its brasses at each end trumpet-shaped from the center to each face of the brass, so that the rod has a right-about-face and "slantindicular" movement, in all directions, merely hanging on its journals, since its faces will be free, and unconfined by flanges, collars, or other guides common to a respectable connecting rod.

The Hampson and Whitehill engine is an elaborate piece of machinery, but one cannot look upon it without the thought arising: "Are we not, in our rage for variable cut-off engines, traveling in the direction of complicated movements, and a multiplicity of parts with very small wearing surfaces, which, though very perfect in their movements while the engine is new, will, after becoming in a comparatively short time worn, cause so much lost motion as to destroy the relations of the various movements one to the other, and thus seriously impair the action and value of the whole?" The quality of engineer co existent with the common slide valve and link motion era will soon be extinct if such engines are to become the rule. This engine also has its connecting rod brass joints open, and has a thump in its movement (as has also the Wright engine) when the connecting rod passes each dead center, the thump when the rod passes the dead center nearest the cylinder being in each engine the greatest, just as it might be expected to be if imperfect adjustment of the connecting rod brasses is partly the cause. Both engines work expansively to a high degree, and will give, no doubt, very economical results. A Bement axle lathe, exhibited by Geo. Place & Co., is a very superior tool. It is so geared that one pound on the cone is about 40 lbs. on the lathe centers, and it has a 3½ inch driving belt. That part of the bed on which the slide rest travels is raised so that the turnings do not fall upon the slides. The wearing surfaces are broad; the lock nut for the tailstock spindle acts upon the extreme end of the spindle guide close to the dead center, and clamps the spindle all around, avoiding the spring usual in such spindles; in fact the whole lathe evidences that its designer has provided a tool fit for a piece work turner (who generally puts a tool to its utmost capacity). On the tool post, however, is a taper washer, by means of which to regulate the hight of the turning tool. With such a washer, it is impossible to put this lathe to the full duty it will perform, because, the face of the washer not being parallel or level with the face of the holding screw, the tool is not so firmly clamped as a heavy duty will require. The centers are not yet turned up, indicating that it is not intended to put any work on the lathe, which is an omission to be regretted.

ESOR.

### Leaf and Flower Impressions.

*To the Editor of the Scientific American:*

In less than five minutes after reading the article in the SCIENTIFIC AMERICAN of September 12, I culled, inked, and printed the four impressions herewith sent.

Take a small quantity of printer's ink, thinly put it on glass, or on the lid of a blacking box, as I did, evenly distributed. The end of the index finger will serve as the printer's ball, to cover one side of the leaf uniformly; then lay it to the exact place where you wish the print to be; lay over it a piece of thin, soft paper large enough to cover it; then, without moving the leaf, press all parts of it with the end of the thumb firmly, and you will have a perfect impression, that no engraver can excel; and by adjusting the leaves at the proper points, accurate prints can be taken, and, aided with the brush or pen, the stem and whole plant can be shown. I have excellent specimens of impressions of barks of trees, made by slicing the bark; and with a little care, the stems can also be taken, as well as flowers. I have many such; and when colored with the aniline colors, they are like colored engravings.

JACOB STAUFFER.

Lancaster, Pa.

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[For the Scientific American.]

### COAL BURNING LOCOMOTIVES IN THE SOUTH.

Burning coal in the locomotives on the railroads in the Southern States is an improvement of recent date. The plan was first tried by the Nashville and Chattanooga Railroad, which has specially good facilities for use of that fuel, there being a number of mines directly on its line. Later it was tried by the Atlantic and Western Railroad (from Atlanta to Chattanooga) with marked success. This road has no coal on its line, but gets its supply from the Dade Company's Mines, thirty miles up the Nashville and Chattanooga road. The company have adapted twenty locomotives for the purpose of using coal, and intend changing them all. As soon as an engine is brought into the shop for any important repairs, it is changed to a coal burner. They consume at this time about 50 tuns of coal per day; it is supplied to them at 9 cents per bushel, and 25 bushels are counted to make a tun. Aside from the time and labor saved, the actual economy is about $5 per day to the locomotive. The coal they use is as good a steam coal as any in the United States.

Stimulated by the operations of others and the absolute need to make better time with their trains, the Eastern Tennessee, Virginia, and Georgia Railroad has also tried the coal burners, and the report to the company at its late meeting says: During the month of July, the coal burners ran 17,600 miles and consumed 6,600 bushels of coal, which cost $660, making cost per mile of 3¾ cents. Wood burners running the same number of miles burned 569½ cords of wood at a cost in tenders of $2.50 per cord, making $1,423.75 or 8 1/10 cents per mile run. The saving will make a fair dividend on many of the Southern roads. The cost of changing to coal burners, they show to be $190 each engine, and they have now changed fourteen. The coal issued by this road is not so good a steam coal as the Dade coal used by the Western and Atlantic Railroad, and costs them 10 cents per bushel; while the latter road gets the Dade coal at 9 cents. The mines are little over 20 miles from Knoxville, and the coal should be cheaper.

The East Tennessee, Virginia, and Georgia Railroad has just finished its business year; and, as an instance of its good management and the prosperity of this section of the South, has declared a six per cent dividend from actual earnings. The summary of shipments from this point shows that, during the past 12 months, 468,469 lbs. bacon and lard, 1,122,174 lbs. flour, 4,809,882 lbs. corn, 1,602,781 lbs. wheat, and 327,348 lbs. hay were transported. Of coal and coke 59,142,000 lbs., of manufactured iron 1,608,187 lbs., of nails and spikes 723,077 lbs., and of marble 312,216 lbs., were shipped. From the shipments of articles, manufactured or produced in and around this place, the road received as freight $103,471.70.

The region of country through which the road runs is one of the finest grass, grain, and fruit sections to be found anywhere; and ample manufacturing facilities are found in the abundance of good water power and cheap coal.

Knoxville, Tenn. H. E. C.

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### New Jersey Minerals.

Several thousand specimens have been quarried from the serpentine and trap Ridges in New Jersey, under the direction of Professor Leeds of the Stevens Institute. They consist of nemalites, occurring in translucent masses made up of long, silky fibers; marmolites of beautiful colors and polished surfaces; exquisitely tufted aggregates of crystals of of hydromagnesite; globular masses of delicately tinted prehnite; clusters of sparkling datholite crystals; star-like aggregations of pectolite, apophyllites, molybdites, natrolites, and other species too numerous to mention. They have been collected both with a view of developing the mineral treasures of the district in which the Institute is located, and to obtain, by exchange with the cabinets of other colleges, a much enlarged cabinet for the Institute itself.

### New and Powerful Iron-Clad.

The Brazilian iron-clad Independencia, of which we recently gave an engraving, has been successfully launched on the Thames. The vessel has sustained no injury and will probably be in the possession of the Brazilian Government by the end of the year. She is one of the most powerful iron-clads in the world; is of 5,200 tuns burden; will be fitted with Penn's expanding trunk engines of 1,200 indicated horse power, working up to about 8,000 horse power; has a prominent gun metal stem, forming a ram; will draw 24 feet 6 inches forward and 25 feet aft, when fully armed and in sea-going trim; is 300 feet in length between perpendiculars, and has 63 feet of extreme breadth. Her armament, which is to be partly in two turrets and partly in bow and stern batteries, will consist of 35 tun Whitworth guns, and she will be bark-rigged. She is expected to make fifteen or sixteen knots an hour with a single screw.

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EFFECT OF SOAP WATER ON INCANDESCENT METALS.—A red hot copper ball, plunged beneath the surface of water containing soap, remains quiet, being surrounded with a thick envelope of vapor.—*Moniteur Scientifique.*

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["OLD AND NEW."]

## DENTISTRY IN THE UNITED STATES.

NUMBER 5.

### THE DENTAL LABORATORY.

Though the operating department of the dentist's establishment makes a brilliant display, with its multitudinous and variously shaped instruments, the laboratory has, perhaps, equal mechanical merits. Its tools are almost as varied as those for operating, equally useful, but not quite as numerous. They make up in size what they lack in numbers. In the laboratory, the dentist uses his lathe, furnace, vulcanizer, forge, rolling mill, steam blowpipe, and gas generator and reservoir, with all their appurtenances, also such small tools as files, scrapers, saws, chisels, plate benders, cutters, punches, hammers, shears, and so on: a few hundred more articles complete the list; and of each of these there are various patterns, sizes, and styles. A first class practitioner usually has in his laboratory, besides these mechanical tools, a miniature chemist's shop, as in his practice he frequently has to use chloroform, ether, acids, tinctures, solutions, elixirs, tonics, chlorides, sulphates, a hundred different chemical preparations, not including the perfumery which he uses for flavoring tooth powder, soaps, and mouth washes. The mechanical department varies in quality and value like the others. A well appointed laboratory costs about six hundred dollars; but there are many dentists whose complete outfit, operative and mechanical, did not cost, originally, two hundred dollars. In the laboratory, the work of making the sets, of false teeth is done. As the mechanical tools are continually getting dull and wearing down in sharpening, and the materials are being used up, the workman has to keep replenishing his stock; and when there is a great deal of mechanical work going on, the outlay is considerable: lathe burrs breaking, furnace muffles cracking, vulcanizers exploding, flasks bursting under too much pressure, retorts breaking, and other such accidents continually occurring. I was once seated in the laboratory of a dentist in the West. He had two "cases" in his vulcanizer, undergoing the process. He had examined the thermometer to note the degree of heat, and turned toward me to make a remark about the amount of pressure which the boiler was sustaining: he had not finished his remark, when we heard a noise like the report of a six pounder loaded to the muzzle without ramming; and the room was instantly filled with steam. When, in a few moments, it settled, it appeared that the boiler had burst. The top had been blown off, and was buried in the ceiling. Had the accident occurred thirty seconds sooner, the practitioner would have been killed. I have witnessed other accidents equally dangerous, though it does not seem as if the business was a hazardous one. In the mechanical department, a moderate practice requires an outlay of three hundred dollars per annum, after having a good start. The receipts of one firm for sales of laboratory tools and material were $62,650; about three fifths of the goods being used in the Western division, one quarter in the Eastern, and the remaining three twentieths in the Southern.

### DENTAL OFFICE FURNITURE.

The principal piece of furniture in the operating room is the dental chair, on the left of which generally stands the spittoon, with the dental operating case forward, to the right. This is what I term the "Torturing Trinity." These few pieces are about all that come under the head of furniture. Of each of these there are various patterns and makes; the chairs costing from thirty-five to two hundred dollars each, spittoons from fifteen to one hundred dollars each; and the case, as is previously stated, almost any price the dentist wants to pay. There are other pieces of furniture, such as the extension bracket table, footstools, and the stands used exclusively by dentists; but they are of minor importance. Nevertheless, all these separate pieces of furniture have to be kept in repair, which adds to the expenses of the office. The chair is so constructed that the seat rises, the back falls, and the head rest can be raised and moved to the right or left. As all these movements are independent of each other, it is easy to see that a considerable mass of machinery is contained among the upholstering, in order to do all this manœuvring. When this machinery gets out of order, the whole has to be taken to pieces before it can be adjusted. The spittoon meets with the greatest amount of mishaps. A patient will drop the tumbler into the glass bowl: at least two dollars is required to replace it. Another, in a fit of agonized abstraction, catches hold of the spittoon top, instead of the chair arm, and pulls it off its balance. The marble top smashes on the floor; the pieces, along with the remnants of the glass bowl and tumbler, are thrown into the dirt barrel; and the operator smiles, says "of no consequence," and puts down ten dollars to expense account. The operating case, being out of the patient's reach, is tolerably safe. But the color in the velvet of the chair will fade. Sometimes the veneer peels; the polish grows dull; the looking glass in the top gets cracked by the wood work warping; all these mishaps have to be remedied, and on such fine workmanship it is expensive. In one city in the Western division, eight dentists kept one dental cabinet maker constantly at work in repairing their furniture. The best furniture is used in the Western division; the next best, in the Southern; and the Eastern uses the poorest. The greater proportionate number of pieces is, however, used in the Eastern division, as there are more permanent dentists in proportion to population.

The uninitiated may imagine these statements exaggerated. Not only is every item mentioned to be found in actual use by dentists, but the enumeration is confined to articles that are commonly used.

The number of dentists in the United States exceeds five thousand; and allowing their gross receipts to be only one thousand dollars a year each, which is a low estimate, the grand total amount of money paid out by the people each year for tooth in and tooth out purposes (to pillage a recent pun) will not fall short of five million dollars.

## ARSENIC IN AGRICULTURAL AND TECHNICAL PRODUCTS.

BY PROFESSOR AUGUST VOGEL.

It is an interesting fact that mineral substances which are poisonous to animals do not always exert a poisonous action on vegetation. Litharge and red oxide of mercury are known to be active poisons for animals, while seeds moistened and planted in either of these poisons germinate as soon as if planted in a fertile soil. This shows that vegetable organisms are not very sensitive to poisons. On the other hand, it is almost impossible to sprout seed in magnesia, a substance which is administered internally in large quantities as a medicine. The injurious influence exerted upon the germination of seed and the growth of the plant, by this apparently innocent substance, was made known in England through an unintentional experiment made on a large scale some years ago: A farmer there had a whole field sown with white earth which he supposed to be calcareous marl. The seed came up very sparingly in this field, and a chemical analysis of the fertilizer showed that it contained a large quantity of magnesia.

There are some poisons which exert the same powerful influence on vegetable and animal life. To these belong the salts of copper and, above all, arsenic with its numerous compounds. A strong, healthy plant can soon be killed by wetting it with a diluted solution of a salt of copper or of arsenious acid. The poisonous action of arsenic on vegetation is all the more striking because it is a substance very widely disseminated throughout the inorganic world; it has been found in many iron ores previously considered free, and in mineral springs, in bones, and even in garden soil. It confirms the statement of a talented chemist, that the analytical chemist of to-day can find everything everywhere if he earnestly hunts for it. Moreover, in the famous Lafarge poison case the celebrated toxicologist, Orfila, not without reason, pledged himself to prove the presence of arsenic in the chairs of the judge and jury at the Palace of Justice.

Without earnestly hunting for it, but rather by accident, we not long since found arsenic in the Munich street gas, which is now generally employed instead of alcohol lamps in chemical laboratories. The occurrence of arsenic in coal gas is not surprising, for it is known that coal always contains considerable quantities of sulphur, which is generally accompanied by traces of arsenic. In a shale, found at Linz on the Rhine, which is largely employed in the manufacture of photogen and paraffin, some not inconsiderable quantities of this poisonous substance were found. When distilled in large quantities, the collecting pipe, where it joins the distillation retort, often contains a brilliant crystaline crust, which is only partially soluble in water, and consists, for the greater part, of arsenious acid along with sulphuret of arsenic and arsenic. In drawing out the contents of the retort, the peculiar garlic odor of arsenic is perceptible. The workmen who charge the retorts frequently complain of colic, and also suffer from inflammation of the skin or ulcers at the root of the nose and in the joints. The inhalation of arsenious vapors must be supposed to be the cause of it. These arsenious vapors, of course, proceed from the decomposition of arsenical pyrites, which always accompany sulphur pyrites, either distributed in a fine state of division throughout the mass of the shale or present in single perfect crystals.

Since arsenic, as we have said, always accompanies sulphur, all the oil of vitriol made from it must contain arsenic; and through the oil of vitriol, the arsenic finds its way into a great many agricultural and technical products, in the manufacture of which this acid is employed. The acid phosphate of lime, known as superphosphate or prepared bone dust, and now so frequently employed as a fertilizer, is manufactured by the aid of crude sulphuric acid. The arsenic in the acid all goes into those artificial fertilizers. The ordinary analytical tests will prove the presence of arsenic in prepared bone dust.

The question naturally presents itself, whether the plants which grow upon soil manured with such substances will not take up the arsenic. Davy undertook to answer this question. For this purpose he set some cabbage plants, in a mixture of one part of bone dust containing arsenic and four parts of garden soil. At the end of four weeks he tested the grown plants for arsenic. The perceptible quantity of arsenic found in the plants proved, what was easy to foresee, that the arsenic of the fertilizer actually goes into the plant.

A no less important question is, whether such plants are able to exert an injurious effect upon the animal economy. With regard to this, Davy made the observation that sheep, fed upon Swedish turnips which were raised with prepared bone dust and hence contained arsenic, would not eat enough of them to fatten. It must not be overlooked that this is but a single observation. It still remains to be proved whether the arsenic contained in the plant is in such a form as to be dangerous to animals and men, and also whether the *quantity* is sufficient to be injurious. In a judicial-medical point of view these observations are very important, since it follows that the finding of a trace of arsenic in the viscera does not permit us to conclude with certainty that the person has been poisoned.

The traces of arsenic found in street gas and in artificial fertilizers are so small that, according to my opinion at least, it is scarcely possible to suppose that a case of direct or indirect poisoning could arise from it. It is, however, to be regretted that the undeniable fact of these fertilizers containing traces of arsenic will injure the confidence in artificial fertilizers which had begun to be so important to the agriculturist.

To set at ease the anxious minds of our farmers, it should here be remarked that a certain quantity of arsenic agrees very well with the animal economy. The expression "poison" is in general only a relative one, for under certain circumstances everything is a poison; and on the other hand, a substance which will kill when taken in large quantities may be employed as a medicine in moderate doses. The most common examples show that the administration of a medicine which is not usually considered a poison, under some circumstances, will become such, if given to a sick person. A teaspoonful of alcohol is evidently a poison in cases of inflammation; and, on the contrary, prussic acid or belladonna, in such quantities as a physician would give it to a person having dropsy, is not poisonous, while the same quantity administered to a healthy person would produce dangerous symptoms. The quantity of opium which a Turkish opium eater consumes is no poison for him, as his body is not in a normal condition. Moreover, Nature can accustom itself to poisons; we know that the workmen in arsenic mines, inhaling an arsenious atmosphere, frequently enjoy the best of health and reach a good old age. Horses fed upon two grains of arsenic, or more, per day, thrive and grow fat on it.

### New Process for Estimating the Alcoholic Value of Wines.

M. Duclaux states that, when alcohol is added to water, the density and superficial tension of the liquid are diminished, and consequently the number of drops yielded by a given volume from a determined orifice is augmented. The dimensions of the orifice being constant, the number of drops corresponding to each alcoholic mixture is constant also, and the variations between one mixture and another are great enough for a very sensitive alcoholometric process to be founded upon them, in the limits within which the ordinary alcoholometer does not move freely, and is uncertain in its indications.

The instrument proposed is a simple pipette of 0·3 cubic inch volume. It is filled with the alcohol under examination, and the drops are counted. The alcoholic value is then determined from tables which have been calculated for various temperatures. The alcoholic value of wines may be thus estimated with considerable accuracy without previous distillation. In these liquids the density varies very little, and is always near that of water; and as their superficial tension depends solely upon the alcohol which they contain, it is but necessary to count the drops which they yield, and refer to the tables for the result.

If to alcohol or water slight traces of a substance with a high organic equivalent, and consequently a feeble superficial tension, be added, such as acetic ether, butylic or amylic alcohol, etc., the number of drops yielded by the alcohol or water rises very sensibly. A measurable effect can be produced with $\frac{1}{4000}$th part of acetic ether. This process is thus available for detecting and approximately estimating certain substances when present in such small proportions as would not be indicated by any other method. By the aid of this instrument, it may be seen that the distilate from wines contains more or less of other matters besides ordinary alcohol, probably alcohols of a higher series.

M. Salleron has proved that the weight of a drop of a mixture of alcohol and water is the smaller the more alcohol it contains; and as the following table shows, the difference becomes larger if the quantity of alcohol be small:

| Percentage of alcohol. | 0 | 1 | 2 | 3 | 4 | 5 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|
| Weight of 20 drops.... | 1 gram | 0·940 | 0·895 | 0·858 | 0·826 | 0·797 | 0·640 | 0·630 | 0·617 |

This shows that a drop counter may be used for determining the quantity of alcohol in wines, and in the administration of Paris such an instrument is used in order to determine whether a wine entering Paris contains more or less than 15 per cent of alcohol.—*Comptes Rendus.*

### Doing Much.

Dr. Hall, in the September issue of his *Journal of Health*—a most excellent family magazine, by the way—truthfully says that many persons seem to be always in a hurry, and yet never accomplish much; others never to be hurried, and yet do a very great deal. If you have fifty letters to answer, don't waste time in looking over to find which one should be noticed first; answer the one you first lay your hands on and then go through the whole pile. Some begin a thing and leave it partially completed, and hurry off to something else. A better plan is to complete whatever you undertake before you leave it, and be thorough in everything; it is the going back from one thing to another that wastes valuable time. Deliberate workers are those who accomplish the most work in a given time, and are less tired at the end of the day than many who have not accomplished half as much; the hurried worker has often to do his work twice over, and even then it is seldom done in the best manner, either as to neatness or durability. It is the deliberate and measured expenditure of strength which invigorates the constitution and builds up the health; multitudes of firemen have found an early death, while the plow boy lives healthily and lives long, going down to his grave beyond three score and ten.

INDIAN TEA EXPORTS.—The Bengal Chamber of Commerce remark, in their last report, that the growth of the tea industry of India has been almost unexampled in the history of its trade. The value of tea exported from Calcutta has increased from $1,150,000 in 1863–64 to $8,500,000 in 1873–74. The economic effects of the industry have not yet, however, been fully examined.

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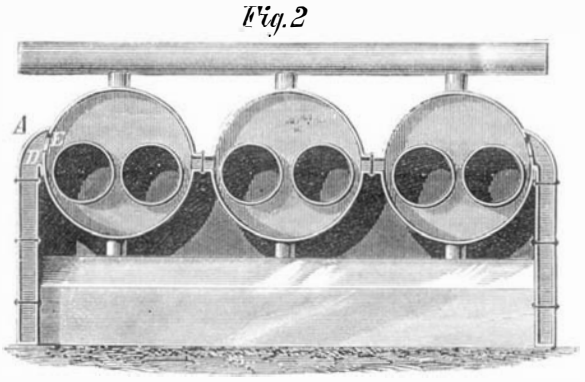
## IMPROVED STEAM BOILER.

For marine use, and in localities where economy of weight as well as of space is of importance, the steam boiler represented in our illustrations will doubtless be found especially suitable. It can be put up without mason work, thus saving the cost of frequent repairing with fire brick, besides the handling and removing of much ponderous material in making other alterations or renewals; while, for the same reason, it is necessarily much lighter than the ordinary double flue generator. An equally important feature is the novel arrangement of a water jacket to form the sides of the fire box, back of the bridge wall and of the boiler, with which the mud drum is connected. In this arrangement the feed water is pumped into the jacket and not directly into the boiler so that, before it enters the main portion of the latter, it becomes heated to the boiling temperature, depositing its sediment in the inclined portion of the jacket, whence the impurities find their way readily to the mud drum. The feed water is thus rendered comparatively pure, scale prevented, and the generation of steam facilitated, while it is further claimed that a saving of fuel is effected of from 20 to 45 per cent, according to the size of the boiler.

Fig. 1 represents a battery of three boilers; Fig. 2 is a transverse sectional view of the same; Fig. 3 shows the single boiler in perspective, and Fig. 4 is a longitudinal section. The peculiar feature of the construction is the water jacket, A, which forms the water legs, and then extends back to the other end of the boiler and across the extremity, as shown at B, Fig, 4. The plates of this jacket are connected by stays, C, and the inner plate is riveted to the boiler shell, at D, Fig. 2. The outer plate extends nearly to the top of the shell, and also connects with the frame by a steamtight joint. A series of holes, E, Figs. 2 and 4, establish communication between the jacket and steam space. The mud drum, F, Figs. 1, 3, and 4, is connected

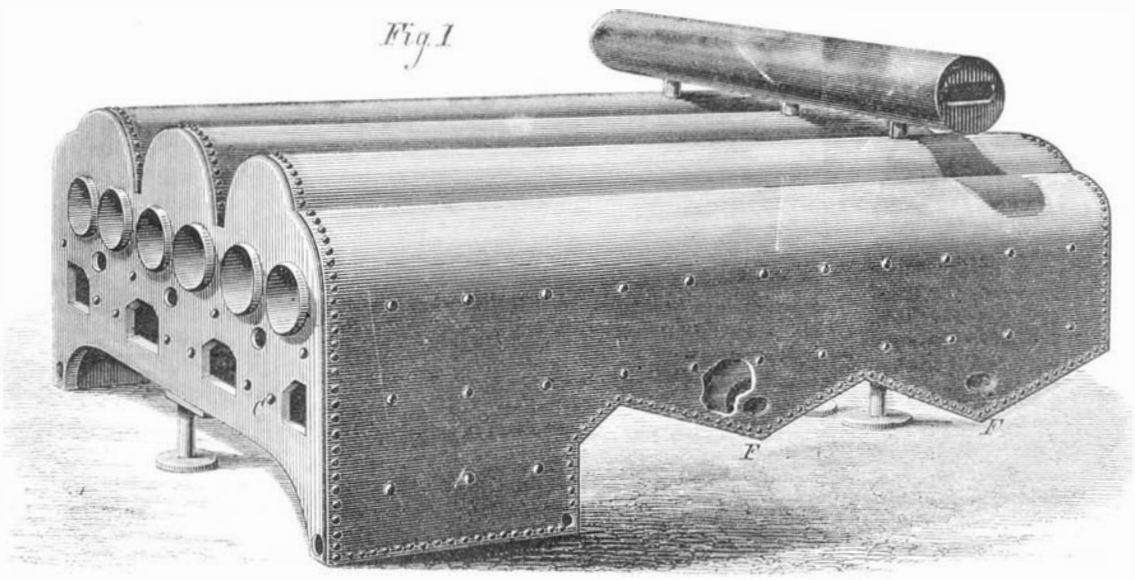
Fig. 2



at the top with the shell, and its ends are riveted to the inner plate of the jacket. This is shown more clearly in Fig. 1. The bridge wall is also a water back, connecting with the water space of the boiler by the tube, G, Fig. 4. It will be observed, in Figs. 2 and 4, that the jacket extends down on each side from the inclined bridge wall to the end of the boiler, thus making the side of the fire flue to be steam generating surface, while the bottom of the jacket slopes both from front and rear toward the mud drum, so as to facilitate the deposit of sediment in the latter. In the battery, shown in Fig. 1, two mud drums are used, and the jacket bottom is made to incline toward both. It will be observed that the boiler is almost entirely enveloped in its water jacket, the stays and indeed all parts of which are easily accessible for repairs. The lower side of the fire flue is, besides, provided with a suitable covering, which may be readily removed for the like purpose, so that there is no portion of the generator that cannot be conveniently reached.

Patented through the Scientific American Patent Agency, April 7, 1874. For further particulars relative to sale of patent, etc., address the inventor, Mr. Nicolas D. Harvey, 55 Prytania street, New Orleans, La.

Fig. 1



HARVEY'S IMPROVED STEAM BOILER.

### Safety Device for Railway Cars.

A practical trial was lately made on the Eastern Railway, Mass., of the safety shoe patented March 8, 1872, by Emery and Doyden. The invention consists of a longitudinal plate of iron, placed under the car track, and suspended an inch or so above the rails. The car wheels pass through openings made in the plate. The latter has side flanges which project down below each side of the rail; and if the wheels leave the rail in either direction, the flanges catch on the rail and the car slides on the shoe, bringing the car quickly to rest. The utility of the invention appears to be fully demonstrated by practice, and its employment very greatly reduces the liability of damage by derailment of cars. The following were among the trial tests

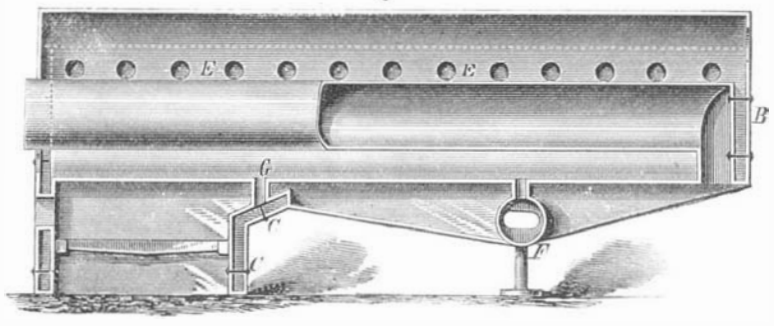
The first test was to open a switch, or set it wrong, as a misplaced switch would be, so that a train must inevitably run off the track. The engine then got up a speed of about twelve miles an hour; the car was detached before reaching the switch. The wheels ran off as soon as the switch was reached, but the shoe immediately caught the rails and the car slid along about three rods, and stopped. By means of a switch rope, the car was then got on the track by again leaving the switch open, the wheels striking the rails, the distance from the edge of the shoe to the center of the wheel being exactly that of the distance between two rails when a switch is opened.

The second test was at a greater rate of speed and was equally successful, the car sliding on the track by means of the shoes only a short distance further than before. The third time the engine went back a long distance from the switch and put on a speed of from thirty to forty miles an hour, and the car came at a fearful rate. The result was exactly the same, the shoes holding the car on the track and sliding a distance of about 300 feet before it stopped. The next test was to take out one rail entirely from the track. The car was then sent along the track at a speed of nearly twenty miles an hour. As soon as the open space left by taking up the rail was reached, the wheels were thrown from the opposite rail, but the shoe on that side caught and held the car on that rail until the open space was crossed, when the shoe on the other side also caught and the car stopped within three rods. The shoe can be applied to any trucks with but slight change, and at an expense for a passenger car of about $115, and of a freight car about $90. In addition to its being a preventive to trains running off the track, it acts as a brake, stopping a train as quickly as a Westinghouse brake or any steam brake.

### Old Boots.

If any body imagines, because an American boot has, as an irreverent humorist expresses it, become "more holy than righteous," because the sole and the upper show an irresistible desire to part company, and because the heel is all on one side and the leather rusty and red, that such things are proofs that its term of usefulness to the human race is ended, then somebody is seriously mistaken. Let it be considered that a medium sized pair of boots packed closely together measure about 36 cubic inches, and that every person in this country casts aside at least one pair per year. The result would be a small mountain of shoe leather, 95 feet in every direction, an amount amply sufficient to arouse a very curious interest as to what becomes of it all.

Fig. 4

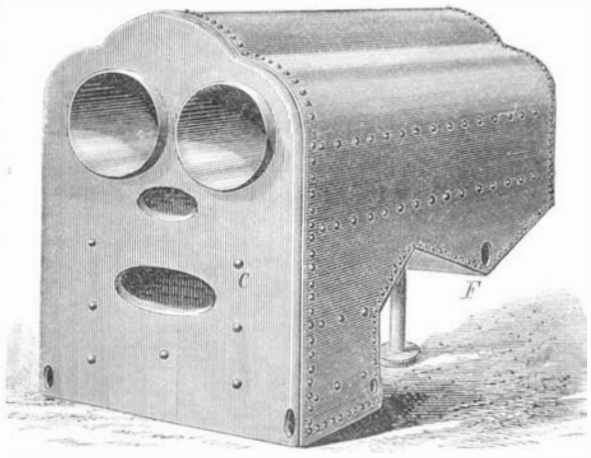


A large percentage of the old boots undergo a second "wearing out" before their treatment as waste. The rag picker who may fish them out of the ash barrel, or the shoemaker on whose floor we may leave them when we purchase a new pair, will sell them to a second hand dealer for some trifling pittance. This last individual, if the uppers be not hopelessly gone, will carefully cut away the ragged edges, and remodel them for entrance into new shoes of smaller size; the legs he will remove from the feet, oil them, and attach them to a new sole and vamp, so that it would puzzle a philosopher to discover the remains of our former well worn coverings in the two pair of spruce-looking and apparently brand new boots and shoes, in the composition of which they play the largest part.

When these wear out, the old leather is too decrepit to be again rejuvenated in the ordinary way, so that finally it, together with the dilapidated soles and demoralized heels, is handed over to chemical treatment, which works marvels; for from the old scraps new leather, ready to enter once more the hands of the shoemaker, is evolved. This is "pancake leather," however, unfit for anything save insoling medium shoes. It is employed, however, by conscienceless Israelites in Chatham street, with unblushing audacity, for making outer soles, and its durability will probably withstand a half mile walk or thereabouts. "Dose vasn't shoes made to valk in," an aggrieved Hebrew is reported to have remarked to an irate customer, who threatened dire vengeance because the soles of his new purchase wore out before he had got around the block, "dose vas gavalry boots!" This delectable material is made by cutting the leather into small bits, mixing it with cement, and then squeezing the whole into a compact mass. A similar article is produced from Manilla rope, which is said to answer better for insole purposes.

There are quite a number of patented processes for the utilization of waste leather, which convert it into leather board, valuable for a variety of employments. One way consists in grinding the material to a meal-like powder, mixing it with gums and cements, and applying steam. The compound is then kneaded and rolled into sheets. Another plan is to mix old leather, hemp fiber, and sheepskin cuttings, and boil with soda ash. Sulphuric acid and coloring matter are subsequently added, and the substance, molded into sheets, forms a good quality of leather board. Oerting's process makes a good waterproof article, which is useful for making buckets and similar objects. It consists in dissolving rubber in benzine, to which a quantity of ammonia is afterward added. The leather in the form of pulp is next

Fig. 3



put in, and the whole worked into a plastic dough. Slaughterhouse cuttings are worked up into glue, raw hide whips, and small fancy articles in immense variety.

We had almost forgotten one valuable employment of old boots—the manufacture of jelly. The reader may stare, but Science smiles superior and asserts very emphatically that a toothsome delicacy can be made from a dilapidated foot covering. Some time ago, Dr. Vander Weyde, of this city, regaled some friends not merely with boot jelly, but with shirt coffee, and the repast was pronounced by all partakers excellent. The doctor tells us that he made the jelly by first cleaning the boot, and subsequently boiling it with soda, under a pressure of about two atmospheres. The tannic acid in the leather, combined with salt, made tannate of soda, and the gelatin rose to the top, whence it was removed and dried. From this last, with suitable flavoring material, the jelly was readily concocted. The shirt coffee, which we incidentally mentioned above, was sweetened with cuff and collar sugar, both coffee and sugar being produced in the same way. The linen (after, of course, washing) was treated with nitric acid, which, acting on the lignite contained in the fiber, produced glucose, or grape sugar. This, roasted, made an excellent imitation coffee, which an addition of unroasted glucose readily sweetened.

By way of conclusion, let us "nail" a paragraph which still crops out occasionally among "scientific items" in country journals, and has reference to the synthesis of leather in tea, affirming that the addition of milk to the infusion of the herb acts upon the tannin therein, to form the leather.

The only difficulty about this statement is that milk does not contain a particle of gelatin, and hence cannot possibly form leather with tannin; so the neat calculation of the number of pairs of shoes which every human being drinks yearly is like the owners of the subject of this article—without substantial foundation

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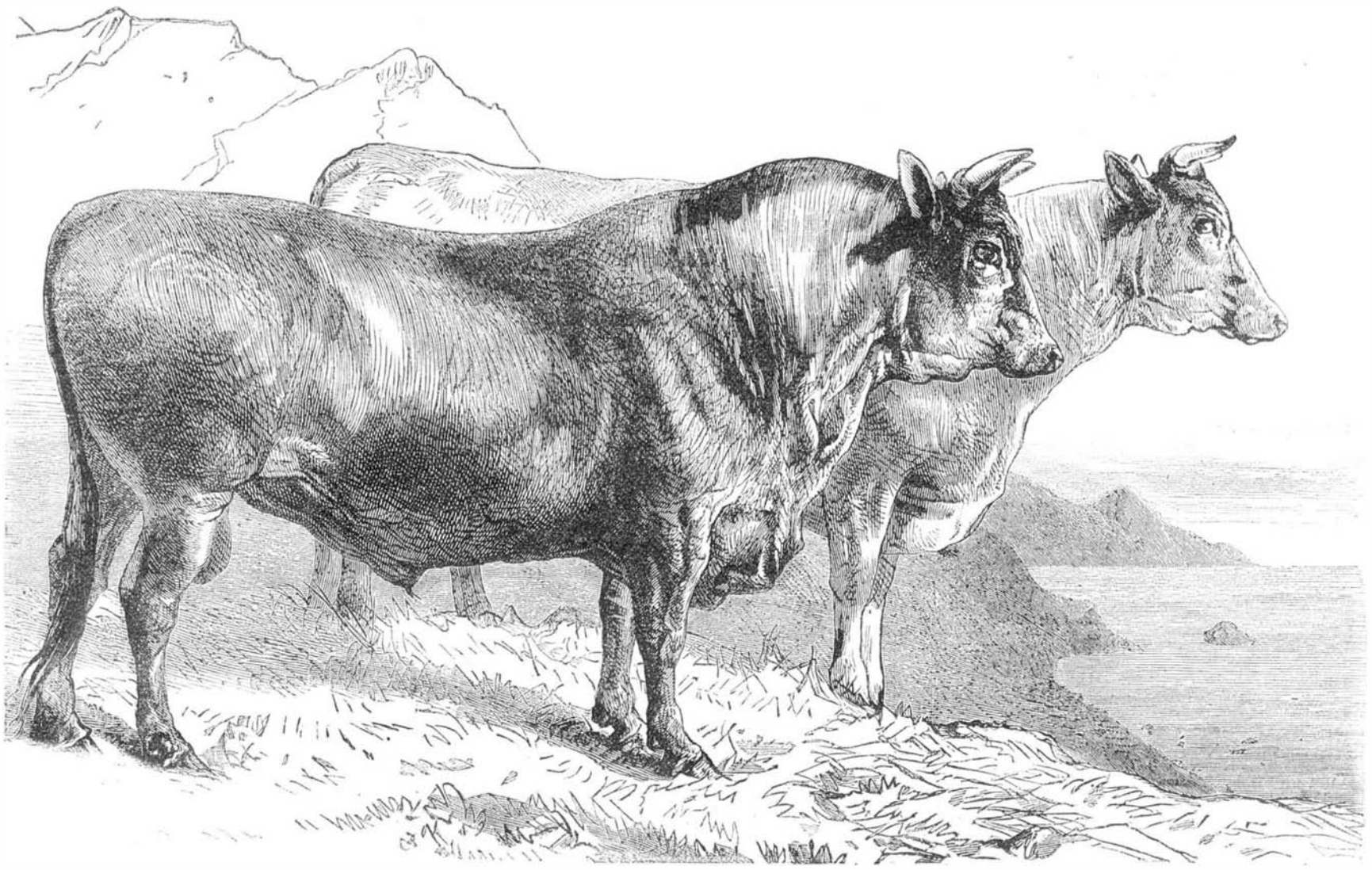
### THE GUERNSEY BREED OF CATTLE.

From time immemorial the island of Guernsey has been famous for its breed of cattle, and a very just reputation it is, for there are few localities in Europe, and certainly none in Great Britain, where a more jealous care has been observed to prevent the mixture of foreign element. Of course, the isolated position of the island has greatly aided the inhabitants in their endeavors; in fact, we doubt if any but a locality so situated could, for so long a period, have preserved a breed so intact. The cattle are larger and more valued than even those of Alderney, the name of which is so familiar throughout the world. They are exquisitely delicate in form; colors varying from light red to fawn and dun, with a few black, each generally with white intermixed. The head is long and handsome. eye large and prominent, horns gracefully formed. For flesh giving qualities they are profitable, and for dairy stock they are truly excellent, yielding, on the average (if properly fed and cared for), one pound of the finest butter per day throughout the year. The size is a fair average, and doubtless the breed would be much larger were it not for the peculiar treatment they have ever been subjected to. The farms of the island being limited in size, it is found necessary to tether the cattle, whereby they lose much of that exercise and freedom which would tend to larger growth. They are also, by this means, too frequently exposed to excessive heat or cold, being without the possibility of choosing then ecessary shelter. Notwithstanding these drawbacks, it is really remarkable how well the animals have always thriven. So great is the demand for this breed that, on an average, seven hundred cows and heifers, with about a dozen bulls, are annually exported.

We give herewith portraits of two fine specimens of this breed, from the pencil of Mr. Harrison Weir, a renowned painter of animal life, for which engraving we are indebted to *The Field*.



GUERNSEY CATTLE.

### THE PROCEEDINGS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

We continue below our brief abstracts of the papers read before this body at its recent meeting at Belfast, Ireland.

#### DEEP SEA CURRENTS.

Under this heading, Dr. Carpenter refutes the common idea that the Gulf Stream exercises an effect upon the climate of the British Isles. That current, he thinks, has nothing to do with the warmth of the winters. The bottom of the Atlantic is covered to a vast depth with icy cold water, caused by the melting of the polar snows. This cold water has a tendency to surge up on certain portions of the North American coast. A slow warm current travels up the western shores of Europe and Africa.

#### DAYS A MONTH LONG.

Professor Purser believes that the moon, in revolvin around the earth and drawing the tides behind her, cause the latter to act as a brake on the revolution of the globes, and he considers that it may be mathematically shown that this action is slowly but surely checking the earth's speed of rotation, so that the days and nights are gradually lengthening. In a thousand million years or so, they may become each a month long.

#### CAN WE MAKE DIAMONDS?

Mr. W. Symons makes ferric ether by mingling a solution of zinc chloride in alcohol and ether with *liquor ferri perchlor. fort.* (B. P.). In this ferric ether, oils, bisulphide of carbon, and other non-conducting liquids may be brought under the influence of weak galvanic currents for many days. In many experiments, bisulphide of carbon was decomposed, resulting in a substance resembling spermaceti. The question is asked whether pure carbon might not be crystalized out by some similar process.

#### MOLECULAR CHANGES OF MAGNETIZATION.

Professor Barrett finds that, just before an iron wire passes to a red heat, a momentary contraction occurs, and subsequently the expansion proceeds regularly. A momentary elongation happens if the wire is first raised to a white and then cooled to a dull red heat. If in the dark, at this moment the wire becomes invisible and ceases to glow, although the sources of heat continue unchanged; it glows again with a bright red heat. The same phenomenon takes place in nitrogen and carbonic acid. The greater the tension of the wire, the more marked is the elongation and contraction, and a very auible click, such as would be emitted by an iron bar when magnetized,is emitted by the wire.

#### UNDERGROUND TEMPERATURES.

This subject is treated in a report by Professor Everett, in which it is pointed out that the average result thus far is that the temperature increases at the rate of 1° Fah. in every 50 or 60 feet in depth. A very valuable set of observations has been received from a mine,1,900 feet deep,in Prague,Bohemia. The depths and corresponding temperatures are as follows:

| Feet. | Deg. Fah. | Feet. | Deg. Fah. |
|---|---|---|---|
| 68 | 47·9 | 1,290 | 58·3 |
| 299 | 48·8 | 1,414 | 59·4 |
| 621 | 50·7 | 1,652 | 61·2 |
| 939 | 57·8 | 1,900 | 61·4 |

#### INDIAN AND CHINESE TEA.

Of these two productions, Professor Hodges considers that analysis shows the former to be the superior. He also finds that with Indian tea fully 68 per cent of the mineral matter and 58 per cent of the nitrogen is removed in the infusion.

#### SPECTRA WITH THE OXYHYDROGEN FLAME.

Mr. P. Braham obtains good results by using a vertical oxyhydrogen jet and introducing the salt of a metal rolled up in thin paper. The length of time that the spectra lasts depends upon the length of paper used.

#### UTILIZATION OF SEWAGE.

The chief point of interest in Professor Corfield's report is that, during the year ending March last, at a sewage farm, 37·7 per cent of the nitrogen brought to the farm in the sewage was recovered in the crop, the amounts during previous years having been 26·0 and 41·76 per cent. The differences were chiefly due to the fact that very different quantities of the crops were left standing at the end of each year.

#### POWER OF THOUGHT IN VERTEBRATES.

Dr. James Byrne considers that the difference between the mental action of the lower order of vertebrate animals and that of the higher orders consists essentially in the fact that the lower orders can comprise in one act of thought only what can be perceived by one sense at one instant, while the higher orders can comprise in one act of thought a series of successions in time. The highest animal can comprise in one act of thought an entire class of co-existents or successions, so far as to combine with a particular fact the common element of co-existence or succession belonging to the class.

#### NEW THEORIES OF VOLCANOES AND EARTHQUAKES.

Dr. Vaughan endeavors to show that the terrestrial crust, if reposing on lava of a declining temperature, would receive accessions of buoyant solid material, chiefly on such points as extend deep into the fiery menstruum, and that the consequent growth of internal mountains would be interrupted only by the occasional movements of this light matter to positions much higher than those at which they were first deposited. To the collision of such masses against the weaker parts of the earth's crust, earthquakes are ascribed Volcanoes are explained by quantities of silicious rock rising and eroding channels. The same spots of the earth's crust, being thus exposed to repeated inroads of intensely heated matter, would be reduced in thickness by the frequent fusion, and would present a weaker barrier to subterranean violence.

#### THE SCIENCE OF EDUCATION.

This was a paper replete with sound common sense, and received with marked attention, since it came from Mrs. Grey. It concludes with a plea for more experienced teachers, and an appeal for system in the art of imparting instruction. What is wanted is that teachers, like practical navigators, shall be furnished with the principles of a science they have not had to discover for themselves, and with charts to guide their general course, leaving to their individual acumen the adaptations required by special circumstances.

The meeting of the Association closed with a brief valedictory from Professor Tyndall, after which Sir John Hawkshaw was chosen President for 1875, and the place of meeting for that year fixed at Bristol.

A MODEL CITY.—A curious piece of mechanism has been produced by an Amsterdam jeweler, called the "Great Mechanical City," and is twenty feet long by fifteen feet wide. There are houses, castles, churches, and stores in it, just as they appear in almost any European city. People walk and ride about. Horses and wagons and railway cars pass through the streets. Boats pass up and down the river, while some are loading and others unloading at the docks Mills are in motion. A fountain plays in the public park, and a band of music fills the air with melody. There are also forts with soldiers parading about them, blacksmith shops with artisans at work in them, and pleasure gardens with people dancing in them.

M. GIFFARD, of injector fame, has invented a method of fitting railway carriages which eliminates oscillation. The carriage is suspended by powerful springs at each end; and at the trials recently made in the presence of some members of the French Association for the Advancement of Science, the carriage was found to be so steady that reading and writing could be easily carried on. It will shortly be exhibited to the English public.

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## THE FAIR OF THE AMERICAN INSTITUTE.

Among the novel and curious inventions exhibited at the Fair is a

HAIR HEADING MACHINE,

the object of which is to straighten out the tangled combings of ladies' hair, arranging the roots all one way. The hair is placed on a rubber pad under a vibrating dull blade which has a kind of drawing motion. The edge of the blade engages against the scales or nap of the hair and forces such as it catches in one direction or the other, to meet endless canvas belts. Upright pins on the latter encounter the hair as it is pushed from under the blade, and, catching it, carry it along, thus straightening it with the roots outward.

One of the neatest little machines exhibited is a

MINIATURE KNITTING MACHINE

made by Messrs. Tiffany & Cooper, of Bennington, Vt. It is clamped to a table and operated by turning a crank which, rotating a little cylinder, causes a spiral cam slot therein to give to the five or six needles the required motion. The cost of the device is a trifle, and it knits such articles as watch guards, curtain cord, and dress trimmings rapidly, and produces a good article.

Another small invention of merit is a

SELF-LIGHTING GAS BURNER.

In this there is a little chamber beside the burner in which is placed a roll of paper, along which are dots of a harmless compound which will take fire by percussion. The end of this roll is carried up near the orifice of the burner; and by turning the cock, the uppermost match is lighted by a slight blow, thus igniting the gas. The device works well and remains operative as long as any of the roll of paper, the end of which is constantly brought into position by very simple mechanism, remains. The cost of the apparatus is said not to exceed that of the matches ordinarily employed.

MEYERS' ROTARY ENGINE

of 50 horse power is exhibited, driven by compressed air. The working portions of this machine are remarkable for simplicity and fewness of parts as well as strength. There are in fact but three moving parts. The ring revolves on its own center in the cylinder, the piston arm is attached directly to the shaft and passes through the ring in a movable bearing; and it terminates in two flukes resting against the inner periphery of cylinder, or one fluke if the engine be single-acting. There are no eccentrics, no springs, and no cams in the engine, and the wearing pieces are all heavy and substantial. The ring is merely a secondary part, as the power goes directly through the piston to the shaft. The machine at the Fair runs readily with an air pressure of ½ pound. This engine will soon be illustrated in this paper.

McCHESNEY'S SCROLL SAW

is a novelty in this form of machine. The frame is made something of an elliptical or flattened C shape. At points corresponding to the ends and middle of the C are pulleys over which pass a belt, the ends of which connect with the ends of the saw, that is, the saw and the belt together form a triangle. To the middle wheel, mechanism is attached which gives it a to-and-fro turning motion so that a reciprocating movement is thus imparted to the saw. The facility with which the latter can be stopped, and the ease with which it can be removed or tightened, render the machine a useful improvement.

Of the

NEW METAL WORKING TOOLS,

there is such a great variety that we can do no more than point out the especial novelties in those which strike us as of merit, leaving to the reader, should he visit the Fair, to make more elaborate examination for himself.

There is a bolt cutter from Messrs. Sellers & Co., in which the oil is pumped directly through the spindle. A drill grinder by the same firm has a neat device for clamping the tool, and an arrangement resembling an index wheel by which the lathe may be turned exactly over one half a revolution.

In the large collection of Messrs. George Place & Co. is a 12 inch slotting machine, which has a new cam motion and in which, instead of the ordinary wheel on top, a rod is provided connecting with a bevel gear at that point. The rod has a handle which is convenient to the workman in front of the machine. In a car wheel borer, we notice a friction arrangement for the feed, the mere turning of a hand wheel throwing the latter on or off at once. There is also a conical bearing for the table, which will doubtless give a truer wear. In a 15 inch shaper, the novelty is a quick return motion, a cam being used, instead of an eccentric, which gives return and drops immediately. An adjustable table which can be placed at any angle is the feature of a new radial drill. It is pivoted to the bed by lugs, and a turn of the pivot bolt with a wrench holds it in proper position. It turns on a circular rack in which suitable gearing operates to give desired elevation. A large table is provided at another side of the tool, to which the drill is easily swung around in doing heavy work.

There is also a three-spindle bolt cutter which opens and closes its dies automatically. The bolts are merely started in and left to themselves; when they are cut to the required depth, they strike previously adjusted mechanism which throws open the dies. This machine has also a new arrangement for the oil, so that the latter is always drawn from the top and hence is pure, not requiring frequent changing. A six-spindle nut tapping machine has its taps so held that they are self-centering, this being effected by a very short squared portion and the holding mechanism acting upon a recess cut near the upper extremity. In using the machine it is only necessary to keep feeding nuts under the taps until the latter are full. Then, by pulling down collars, the tools are instantly released and the nuts may be readily dropped off. A new axle lathe has two changes of feed, and the clutch instead, of being at the tail of the lathe, is between the two gears. The handle is so arranged as to be always convenient to the workman wherever about the tool he may be, and there is a friction attachment acting on an expansion box, which, enclosing the tail spindle, allows the latter to be readily and quickly set. We reserve mention of other machine tools for a subsequent article.

Among the entries which merit passing mention is a very fine display of

WOODWORKING IMPLEMENTS

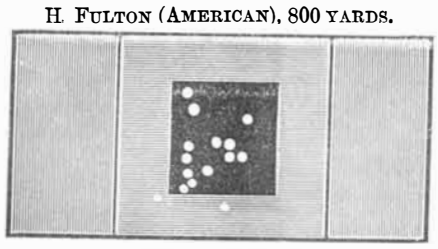
by D. R. Barton, of Rochester, N. Y., and a case of bolts from Hoopes & Townsend, of Philadelphia. These exhibits are alike conspicuous for their intrinsic merit and for the exceptional taste shown in arranging them for show. We notice also that President Morton, of the Stevens Institute, contributes several fine mathematical and scientific instruments from the collection of that college, and that Professor Thurston is exhibiting his machine for testing the metals. Those of our readers who have profited by the Professor's very able articles on testing, strains, and similar topics, which we have lately published, will doubtless inspect with much interest this machine, now for the first time publicly displayed.

## THE INTERNATIONAL RIFLE CONTEST.

The trial of skill between six riflemen of America and six from Ireland, ended in a victory for America, the shooting on both sides being marvelous for accuracy. Two hundred and seventy shots (fifteen for each man at 800, 900, and 1,000 yards respectively) were fired on each side; and 4 points being given for each bullseye, the possible total was 1,080 to each competing team. The Irish party marked 931, and the Americans, previous to the last man's last shot, exactly tied them. Colonel Bodine was firing, and on him depended the result. He scored a center, 3 points, making a total of 934. We believe this total has never been exceeded. But the equality of the two scores was even more remarkable than this, as the Irish side lost 4 points by one marksman firing at the wrong target, on which he made a bullseye.

We give herewith diagrams of the four most remarkable scores:

H. FULTON (AMERICAN), 800 YARDS.



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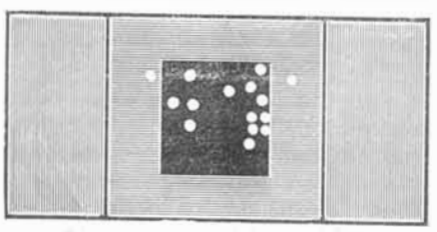
J. B. HAMILTON (IRISH), 800 YARDS.



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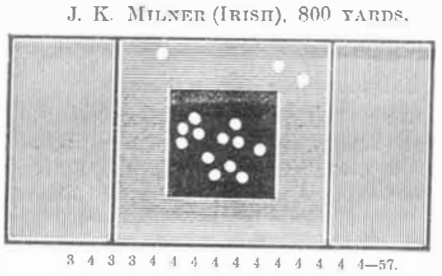
J. K. MILNER (IRISH), 800 YARDS.



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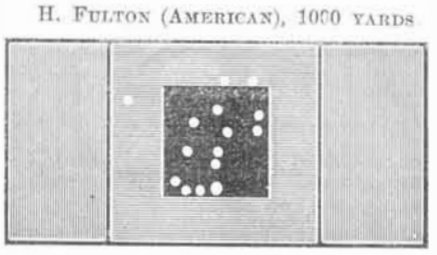
H. FULTON (AMERICAN), 1000 YARDS



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## DECISIONS OF THE COURTS.

### United States Circuit Court---Southern District of New York.

PATENT AIR-CARBURETING APPARATUS.—THE GILBERT & BARKER MANUFACTURING COMPANY *vs.* OAKES TIRRELL.

WOODRUFF, *Circuit Judge:*

The bill herein is filed to restrain the infringement of a patent granted to J. F. Barker and C. N. Gilbert, on the 3d August, 1869, for an improved apparatus for carbureting air.

By means of this apparatus, it is claimed that gas is produced from petroleum, and similar volatile oils employed for carbureting atmospheric air, thus rendering it combustible, light-producing, and suitable for lighting houses, manufactories, etc.

Neither the process nor the chief parts of the apparatus are claimed to be new. The claim in the patent which the defendant is charged with infringing is in these words: "The arrangement of the carbureter with a meter wheel, said meter wheel being driven by a descending weight or other equivalent mechanical power, applied to force the air through the carbureter to the burners, said carbureter being placed within a vault by itself, separate from the building to be lighted, the whole arranged and connected with pipes substantially as herein (that is, in the specification) described and set forth. * * *

The chief feature of the improvement is in the placing of the carbureter underground, in a vault separate from the building to be lighted, at any desired or convenient distance therefrom, while the power and the motor, by means whereof the atmospheric air is forced through pipes leading into the carbureter, is placed in an apartment in the building, or near thereto, conveniently accessible with or without a light, as occasion may require, whenever for adjusting the motive power or machinery thereof it is desired to do so.

Such apartment being thus wholly separated by walls or intermediate earth, or both, no gas from the carbureter pervades it, and no danger of explosion arises. *

Three questions are hereupon raised. Was this new arrangement patentable? Was it new, and were the patentees the first inventors? Does the defendant infringe? 1. Upon the first question, it is insisted that the patentees merely changed the location of the carboureter, and that the mere change in the location of an old device is not patentable.

In Marsh *et al. vs.* the Dodge Stevenson Manufacturing Company, in the Northern District, at the June term, 1873 (3 *Patent Office Gazette*, 398), I had occasion to say that "mere change of location is not invention." But it was also held that "where change of location involves the employment of new devices to adapt an apparatus for use in the new position, and a beneficial result is produced, then this location, in its connection with such new devices—that is, the means by which the result is produced—and not the result itself—is patentable. And where such change of location brings into existence a new combination of devices, operating by reason of such new combination to produce a new and useful result, such new combination is patentable." *

The most important inventions ever made consist in subordinating natural elements or controlling natural laws to the production of useful results.

I cannot doubt that the invention of the patentees was patentable, as truly so as it is abundantly proved to be greatly useful and valuable.

The questions of fact: Was this arrangement new, and were the patentees the first inventors? must be answered in affirmative. *

Does the defendant infringe? It was but feebly, if at all, insisted that if the arrangement of devices by the patentees was entitled to be called invention and was patentable, as above explained, the defendant did not employ its distinguishing features or characteristics. The details in the construction of his carbureter were not precisely like that used by the complainant, but those specific features were not claimed. The substantial operation of his carbureter and the mode of impregnating the atmospheric air are alike in both.

The difference between the apparatus of the defendant and that of the patentees, chiefly relied upon, is that, whereas the latter make the cavity below the ground a vault having surrounding walls, the defendant, having inserted his carbureter in the cavity, surrounds it with earth in direct contact therewith, and carries up to the surface a pipe through which to replenish the carbureter with oil, instead of having a removable opening to the vault below, employed by the patentees.

The substance of the invention the defendant uses. The means of its effective useful operation are the same. The even, moderate temperature of the earth, the underground passage of the gas, and the effect thereof are alike used in both. The difference in the construction of the carbureter used by the patentees, as described in the drawings, may make a more permanent opening about its sides desirable, but I cannot regard these details as of the substance of the invention. The apparatus of the defendant does substantially operate by the same means, in the same way, and to produce the same result.

The complainant must have a decree for an injunction and account in the usual form.

[*Stanley, Brown & Clarke*, for complainant.
*Wetmore & Jenner*, for defendant.

## NEW BOOKS AND PUBLICATIONS.

THE AMERICAN GARDEN. Edited by James Hogg. Published monthly. $2 a year. Brooklyn, N. Y.: Beach, Son & Co., 76 Fulton street.

The October number is the second of a new series, which renders the present a favorable time to subscribe. The number before us contains a great variety of information on floriculture, hints on gardening, fruit raising, and kindred subjects, accompanied with a descriptive catalogue of Dutch bulbs, lilies, etc., appropriate to the season. Among these are many new varieties, with practical hints in their culture and management. In form and character of information, the *American Garden* is similar to the English *Garden*, and is designed to occupy the same field in this country that its namesake does in England. The information is adapted to our soil and climate, which renders it of special value to all lovers of flower culture. It contains the names and description of all new varieties of plants and bulbs, and occupies a place in floral literature opened by the advancement of American taste.

ELEMENTS OF DESCRIPTIVE GEOMETRY. By S. Edward Warren, C. E., Professor of Descriptive Geometry in the Massachusetts Institute of Technology, and Author of a Series of Works on Geometry and Stereotomy. Part I., on Surfaces of Revolution. Large 8vo., 252 pp. New York: John Wiley & Son, 15 Astor Place.

Professor Warren's books are recognized throughout the country as the highest authorities on all branches of practical geometry. His method of classifying the problems by which the whole science is elucidated is excellent, and shows the hand of a master in the difficult art of imparting instruction. Such books are needed now more than ever, when there is a worldwide awakening as to the importance of technical instruction as a branch of common school education. The book is admirably illustrated ith numerous folding plates.

POLITICS AND MYSTERIES OF LIFE INSURANCE. By Elizur Wright, late Insurance Commissioner of Massachusetts. Price $1.50. New York: Lee, Shepard, and Dillingham.

The author of this excellent treatise has added to his great reputation as an authority on this important subject. It is stated that more than 500,000 persons, chiefly heads of families, have insured their lives in the United States, depositing their money periodically in the hands of corporations who are alleged to be nearly irresponsible, while their constitutions and regulations are so complicated that persons wishing to discontinue their insurances or to surrender their policies are nearly always victimized.

THE MOTHER'S HYGIENIC HAND BOOK, for the Normal Development and Training of Women and Children, and the Treatment of their Diseases by Hygienic Agencies. By R. T. Trall, M.D., author of "The Hydropathic Encyclopædia." etc. Price $1. New York: S. R. Wells, 389 Broadway.

Dr. Trall is well known as the author of various excellent works on hygiene. His views on diet, regimen, and dress are sound and generally acceptable.

ON THE STRENGTH, ELASTICITY, DUCTILITY, & RESILIENCE OF MATERIALS OF MACHINE CONSTRUCTION, a Paper read before the American Society of Civil Engineers. By Professor R. H. Thurston, Stevens Institute of Technology, Hoboken, N. J. New York: D. Van Nostrand, 23 Murray street.

A reproduction of several articles, of the highest interest and value which have already appeared in our columns.

THE WESTERN PHOTOGRAPHIC NEWS, a Monthly Magazine of Photographic Art. Vol. I., Nos. 1, 2, 3. Chicago, Ill. Charles W. Stevens, 158 State street.

This periodical contains much news, domestic and foreign, as to the photographer's art, and some valuable recipes and practical directions.

CINCINNATI INDUSTRIAL EXPOSITION CATALOGUE (German Edition). M. & R. Burgheim, Cincinnati.

EIGHTH ANNUAL REPORT OF THE MASTER CAR BUILDERS' ASSOCIATION. New York: S. W. Green, 16 Jacob street.

## Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From September 8 to September 17, 1874, inclusive.

ANGLE BRICKS.—J. E. Billings, Boston, Mass.
BUTTON HOLE SEWING MACHINE.—H. E. Townsend, Boston, Mass.
CAR WHEEL.—E. B. Meatyard, Geneva Lake, Miss.
CLEANING GRAIN, ETC.—G. E. Throop, Syracuse, N. Y.
DESIGNS ON FABRICS.—W. Engetsdorff (of Chicago, Ill.) London, Eng.
DRIVING SEWING MACHINES.—J. Proctor, Boston, Mass.
GOVERNOR.—C. C. Jenkins, Philadelphia, Pa., *et al.*
IRONING HATS.—R. E. Brand, Plainfield, N. J.
LEATHER ROUNDING MACHINE.—H. F. Osborne, Newark, N. J.
MACHINE GUN.—W. B. Farwell, New York city.
MATERIAL FOR WELDING IRON, ETC.—H. Schierloh, Jersey City, N. J.
PORTABLE GAS APPARATUS.—W. F. Browne, New York city.
PRINTING TELEGRAPH.—G. W. Howe, Stevenson, Ala.
PROPULSION OF VESSELS.—P. S. Devlan, New York city.
RAISING COAL, ETC.—J. L. Bates, New York city.
SEWING MACHINE.—H. P. Garland, San Francisco, Cal.
SEWING MACHINE.—W. S. Guinness (of New York city), London, England
SURFACING METALS.—L. Bollman, Vienna, Austria.
WASHING MACHINE.—W. Scott *et al.*, Chicago, Ill.

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# Recent American and Foreign Patents.

### Improved Lathe Dog.

J. Henry Stimpson, St. Louis, Mo.—This invention relates to that class of lathe dogs in which are combined two serrated and slotted plates, each carrying a jaw, and clamped together and to the face plate of a lathe by a bolt. It consists in the application to the plates of serrations of such construction as to cause the jaws at all times, when force is applied, to be forced toward each other, and an improved construction and relative arrangement of the parts by which all torsional or twisting strain is obviated, by directing the force applied to close the jaws in planes that pass through and on both sides of the point of resistance.

### Improved Drill Joint.

John H. Bauser, Parker's City, Pa.—By this device, the connection of the drill joint is strengthened without increasing the size of the coupling or joint, and also the breaking of the joint and consequent expense in removing the shaft is to some degree prevented. The adjacent ends of both parts are sufficiently enlarged for greater strength of the joint, and one part is provided with a threaded screw pin and a screw extension of smaller diameter. The socket of the adjoining part is recessed, threaded, and fitted for screws, securing, by means of the shoulders, a strong and intimate joint of parts.

### Improved Smoke Stack and Spark Arrester.

J. Wellington Nesmith, Golden, Col. Ter.—This is a smoke stack and spark arrester for coal-burning locomotives, which will not only prevent the escape of sparks, but economize fuel. There is an inverted pot over the top of the flue, confined in any substantial manner. Attached thereto is a series of concentric flanges, forming (together) an open pyramid, surmounted by a cap, and the smoke stack has a diamond-shaped head. The entire products of combustion, as well as the exhaust steam, are discharged into the inverted pot, and from that downward; the sparks falling, and the smoke, steam, and gases rising.

### Improved Car Coupling.

Harrison E. Smith, Portland, Oregon.—This car coupling consists of a drawhead with weighted horizontal jaws swinging on small pivot pins, and connected to the drawhead by a vertical fastening pin. The jaws are recessed for the enlarged conical head of the coupling link, and lock over the same by the action of a diametrical cam on shoulders of the rear parts of the jaws. The cam is keyed to a lateral shaft, turned into horizontal position for uncoupling by mechanism applied to the top or side of the car, and held in position for uncoupling by the hook end of a weighted pivoted lever, which catches over a lug of the cam shaft, releasing the lug by the concussion of the drawhead, and producing the instant coupling of the pins to the link head.

### Improved Wagon Body.

Benjamin Rankin, Jeffersonville, O.—This is a strong and durable wagon body, which may be readily taken apart for unloading, or for the purpose of storage, while it is easily put up by any person, and forms a secure and rigid connection of the sides, end gates, and bottom parts. The detachable sides and end gates are firmly bound to the lateral bottom pieces by hinged hook bars of the same, swung in upward direction, and by stationary hook bars of the sides, in connection with a longitudinal side chain applied by screw bolts and cranks. For the purpose of discharging any load at once, without the use of a scoop, the cranks are released from the screw bolts, and the chains detached from the hook bars. The end gates are then taken off, and the sides raised out of their socket.

### Improved Molding Machine.

William F. Wolf, Hollidaysburg, Pa.—This invention relates to an improvement in the means of connection between the treadle and the flanged balance wheel that is fixed horizontally on the bit stock or mandrel to which the molding cutter is attached. On the lower part of the mandrel is a griping clutch, which is carried forward or backward by a flanged pulley for turning the mandrel continuously in one direction by griping the flange of the balance wheel when it goes forward, and letting it go when it moves backward. This griping action is effected by the form of the clutch, which is a tube with radial arms, and has two exterior projections, one wedge-shaped or triangular, for engaging the notched inner side of the flange when the clutch moves in one direction, but not when moving oppositely, and the other projection, which is round or smooth, serving to hold the clutch in position to cause the engagement referred to.

### Improved Printing Roll.

Franklin E. James, New York city.—This invention relates to fastening the figures of paper-printing rolls upon them, the rolls being made of lead or other soft metal. It consists of cutting or engraving the outlines of the figures upon the surface of the roll, and driving the brass pieces used to project said outlines above the surface sharply into the cuts. Said pieces are previously drawn down to a feather edge, to be caused to burr out on one or both the sides by being driven to the bottom of the cuts, so as to be forced into the walls of the cuts to secure them in the rolls without the expense of soldering, screwing, or pinning them.

### Improved Lamp Bracket.

Charles H. King, Central Falls, R. I.—The main arm swings in any direction of the circle, and may be fastened by the base clamp to any object and under any inclination, while adjustable upper arms and basket regulate the hight and produce the horizontal position of the lamp. The flexibility of the bracket admits of its unlimited and useful application for the various purposes, and its easy detaching and storing away when not needed.

### Improved Flood Fence.

David T. Deffenbaugh, Lilly Chapel, O.—This invention is an improvement in the class of flood gates whose lower fastenings are disengaged or loosened as the water rises, thus allowing the gates to swing out with the current. As the water rises, it raises the gate so as to unlatch latches which allow the gate to swing down with the current. Should, however, the panel not rise with the water, the pressure of the water against the upper part of said panel will cause said upper part to swing forward, which will draw the latches out of the catches, when the panel will swing down with the current.

### Improved Faucet.

Lemen J. Birgler, Cincinnati, Ohio.—This is a faucet with vent attachment, for drawing off liquors from the barrel without the aid of a vent in the bung or other part of the barrel. The vent works automatically in connection with the opening and closing of the faucet. The faucet has a guide tube and sliding vent tube, and is provided at the inner end with a flexible rubber tube and floating valve, and with a second valve at the outer end, through which air is drawn into the barrel when the faucet is opened.

### Improved Rein Holder.

John Royse, Dodd City, Tex.—This rein-holding device consists of a pivoted, vertically swinging cam or locking jaw and a frame constructed suitably for attachment to the dash board of a carriage. The two jaws are curved on corresponding or parallel lines, so that they bite the reins at every point between their opposing faces. The horizontal arrangement of the movable jaw economizes space, and conduces to strength.

### Improved Fare Box.

William S. Clapp, Carmel, N. Y.—This invention consists of a double spout, composed of a tapering entrance spout, with a central wire running at some distance below the slit. A supplementary tapering spout incases the former, and the whole is formed of a blank of sheet metal made of one oblong piece with triangular side extensions and lateral slit, to be bent into shape and soldered at the connecting edges, and then applied to a fare, letter, or other box.

### Improved Die for Making Nuts.

James Hervey Sternbergh, Reading, Pa.—The piece of metal is placed, in order to be compressed into shape, in a centrally perforated female die. A centrally perforated male die is made to fit the cavity, their perforations registering, so that the holing punch may pass freely through both. The nut has an angle-sided projection on the bottom, so as to lock to the washer which will be used with it. In order to accomplish this, the male die is made with an angular internal cavity, corresponding to the form of the projection.

### Improved Compound Railroad Rail.

Isaac Thomas, Jackson, Mich.—This compound rail is formed of two parts or sections, which are confined together by keys. A beveled surface gives the head of the rail a good bearing, while the key holds the foot piece securely to its foundation. The key passes through holes punched in the parts of the web at suitable distances from each other, and stands at an angle of about forty-five degrees with the base, with its main bearings on the outside of the web, and on the top of the foot piece.

### Improved Hydraulic Jack.

Edward Biddle, Carlin, Nev.—This is a convenient implement by which cross heads may be forced out of piston rods, bolts out of engine frames and cylinders, and similar work be done where only a small space is available for the application of the tool. The invention consists of a hydraulic jack, constructed of a piston or ram, with packed end sliding in a tube, being forced forward by the action of the liquid, which is compressed by a tightly packed piston fed forward by means of its screw bolt and a ratchet wrench in a tube, under right angles to the ram tube and connected therewith.

### Improved Hemp Brake.

Thomas J. Dean and Montgomery W. Forward, Lawrence, Kan.—A carrier runs from under a stationary beater under the revolving beaters, and thus continually presents the flax hanging over the stationary beater to the revolving beaters, so that they have a more efficient action in the way of stripping the broken stalk from the fiber. The standards for the crushing rollers and the revolving beater are pivoted to the bed frame, and they are connected together by adjustable bars and braced, so that the revolving beaters and the stationary beaters can be adjusted relatively to each other, as required.

### Improved Iron Bridge.

Andrew Burneson, Mansfield, O.—Two angle plates, of the same size, are fastened together at the edges by riveting them to angle bars, either with or without a flat plate between them. They are arranged in the bridge with the corners of the chord thus formed lying in a horizontal plane, resting the end against the vertical plate of the shoe, and on the bottom plate. The suspending rods are attached by a yoke, embracing the lower side, and bolted to another yoke on the top, and are thus connected without bolting through the chords, except at the flanges. A top chord is composed of two angle plates, secured together by angle bars and a flat plate. The suspension rods are secured to the flange of the chord by a yoke and yoke-shaped bolts. The braces are secured to the chord by angle ends and yoked bolts.

### Improved Screen for Coal, Ores, etc.

Peter Hayden, New York city, and William B. Hayden, Columbus, Ohio.—This invention relates to a screen which is formed of parallel bars, rests on and is revolved by a series of rollers having stationary bearings in a suitable frame. The bars are secured to the rims by stud pins on each side, which enter notches in the side of some of the rims, while the bars enter inside radial longitudinal notches in the rims, and are held in place by a ring bolted on against the bars at one end. The rims are connected together by long rods with tubes on them, extending longitudinally between to keep them the requisite distance apart. This is a simple and economical mode of constructing the screen frame in sections, so that it can be lengthened or shortened by putting on or taking off sections. Part or all of the longitudinal screen bars are constructed with beveled inner edges, and so arranged that they will arrest thin pieces of slate as the screen rotates.

### Improved Middlings Purifier.

George W. Dellinger, Ripon, Wis.—This consists of a series of horizontal circular sieves, one above another, on a hollow shaft, with a hopper or funnel below each sieve. A discharge gutter is placed at the periphery, and a fan blower is connected with lower end of the hollow shaft. All parts are so contrived that the air blows up through the sieves from below, and, together with the centrifugal action of the sieves, which have an oscillating motion, causes the light matters to pass off over the edges of the sieves to the gutter, while the heavier matters passing through the sieves are conducted by the hopper to the center of the next sieve below, in a manner calculated to be very efficient in separating the impure matters from those suitable for regrinding.

### Improved Trunk.

Thomas J. Massic, Arrington, Va.—This invention relates to mounting or suspending a cylindrical trunk on trunnions so as to revolve within a shell, and to providing the inner trunk with hinged loops for supporting it when removed from the shell or trunk case.

### Improved Throttle Valve.

Ethan A. Gates, Burlingame, Kan., assignor of one half his right to Sanford R. Leonard.—The packing is an elastic ring cut longitudinally, and confined between the shoulder of the valve and below the nut at the top, and is made to snugly fit the valve cylinder. This packing ring is expanded by means of a wedge. A chamber in the shell, around the cylinder, is provided with three ports on the sides of the valve. When the valve is on its seat these ports are closed, and when the valve is raised the steam passes through the ports into the chamber, and is discharged into the steam pipe attached to the shell. An oil tube passes down through the shell, and delivers oil to lubricate the valve. This valve is balanced by the pressure of steam upon its sides, so that it works up and down with out undue friction, and always works steam tight.

### Improved Water Wheel.

Frederick W. Tuerk, Jr., Berlin, Can.—This is an improved water wheel which may be run with a very low head of water, which shall be free from back pressure and waste, and will thus utilize almost the entire force of the water. The invention consists in curved and pivoted buckets, having shaped recesses in its rim. Wedge-shaped recesses are also formed in the rim of the wheel beneath the upper part of the buckets. There are curved slots in the partition plate and two sets of openings. With this construction, when the water is admitted through the chute, it flows through the one set of openings, being guided by a ring flange, and enters the wedge shaped recesses. It thus forces the buckets outward, so that the wate that enters through the other set of openings may strike against the buckets and drive the wheel forward. As each bucket enters an enlargement of the case, the water flows past them and strikes against the rear sides of the flanges or chutes, and is thrown back against the forward side of the buckets, closing them before they can strike against the said flanges or chutes.

### Improved Ventilator Register.

Henry A. Gouge, New York city.—This ventilator register allows the air to enter the ventilating flue in a body, instead of being broken up into small streams, so that it may enter the flue in a compact current. A plate is supported on posts in front of the register, and its distance therefrom may be adjusted as desired. Inside the register is a valve hinged at its lower side and supported by a cord and weight so that it will stay in any position in which it is placed.

### Improved Car Step.

José Medina, Cordova, Spain, at present residing in New York city. Office 62 Water street.—Each step is so arranged that by moving a hand lever the conductor can raise it or turn it on hinges so as to cap over the edge of the platform. On the entrance or exit of the passenger, the step is lowered, and the weight of the person, acting on suitable levers, moves spring pawls and through them a ratchet wheel governing a dial above the car door, which registers the fact. In addition to their office of operating the registering apparatus, the steps prevent passengers getting on or off the cars at will, whereby many accidents are avoided. They are also a check on the conductor, since a failure to raise the steps while the car is in motion would be considered equivalent to an attempt to defraud the railroad company.

### Improvement in Mounting and Setting Guns.

James L. Avery, Madison Court House, Fla., assignor to Walter E. Avery, same place.—This invention is a spring gun for setting to be discharged by game or by burglars; and it comprises a stand for holding the gun, with a holder and clamp for attaching the gun to the stand. There is a breech piece of a peculiar construction, whereon the lock is mounted, adapted for attaching to any gun; and a baiting trigger for causing the game to fire the gun by its efforts to get the bait. The lock is provided with means for causing it to pull hard or easily.

### Improved Vehicle Spring.

Robert Walker, Harrisville, O.—This is an improvement on the carriage pring for which letters patent were granted to same inventor Decembers 9, 1873. The ends of an elliptic spring are connected by yokes around which open oval springs are passed. The latter are kept in place by projections on the yokes, and to one end of each is attached a block for the other end to strike against. There are also curved springs, the centers of which are attached to the centers of the upper and lower parts of the elliptic spring, and the ends of which rest upon the arms of the oval springs. These are slotted to receive bolts, by which they are kept in place laterally, while being allowed to slide longitudinally when the spring is put under pressure.

### Improved Furniture Caster.

Cevedra B. Sheldon, New York city.—This invention relates to the construction of the socket for fitting in the furniture leg to receive the spindle of the caster wheel. It consists of the lower part of the socket, particularly the flange or collar which fits against the furniture leg, and having the chamber or channel for the anti-friction balls formed of a disk of sheet metal stamped in the shape required. The upper portion is formed of a plate of metal bent up in a tube and connected to the disk. This socket is to be used instead of the ordinary cast metal sockets, when deeper ones are required than can well be made in one piece of sheet metal by stamping or pressing the flange and the socket in one.

### Improved Chair.

William W. Crawford, Delaware, O.—This is constructed in a strong and neat manner, and made more comfortable by giving greater play to the feet. The arms are supported, back of the front legs, by separate supporting pieces connecting the side rounds or stretchers and seat.

### Improved Horseshoe.

Luther W. Griswold, Marshalltown, Iowa.—The object of this invention is to so construct horseshoes that they can be readily put on and taken off the horse's hoof without nailing or resorting to the blacksmith; and it consists of a shoe made in two parts, which are fastened together by means of dovetails at the heel and a screw at the toe. By turning down the screw the shoe is securely fastened, and may be tightened at any time by putting a cloth or rubber cushion beneath the foot. By loosening the screw the shoe is readily removed.

### Improved Gun Sight.

Samuel W. Johnson, Newton, Mass.—A hollow cavity is made with a file in the bottom in the front face of the sight, surrounding the sight opening, or above or below, or on two opposite sides of it. The end of a match or other phosphorescent compound is revolved in the cavity, with sufficient pressure to scrape off enough of the phosphorus to partially illuminate the sight, so that it can be seen in the dark.

### Improved Windmill.

Jacob L. Rust, Millersburg, Ill., assignor to himself and Oliver A. Bridgford, same place.—This invention is provided with a regulating device which begins to operate when the wind strikes the face of the wheel and side vane with such force that the action of the weight on the same is over come, throwing thereby the wheel back toward the main vane. The greater the power of the wind, the smaller becomes the angle between the wheel and the main vane, till the same assumes at last a position parallel to the wheel. The wheel turns thereby more and more the outer edge of its wings toward the wind, so that its effect on the wheel is not increased, but the speed of the wheel kept up at a regular rate. When the wind diminishes, the weight carries the main vane gradually back in its old position, regulating thus the speed of the wheel in a simple and effective manner.

### Improved Car Coupling.

Philip Oswald, Smithsburg, Md.—This invention relates to certain improvements in car couplings, and is a new and improved arrangement that is adapted to the construction of any of the ordinary cars, is simple in design, substantial in its construction, and possesses, in consequence of the same, great durability. It consists of a drawbar having upon its front end an abutment which acts as a buffer and an inclined hook over which a link passes when the coupling is effected, and upon its rear end a downwardly extending lug. Said abutment has behind it a cushion of rubber held between the same and the bumping sill of the car, and the said lug of the drawbar presses against a rubber cushion in front of it, the same being disposed inside a clevis-shaped piece just in the rear of the bumping sill and securely bolted to the framework of the car upon the sides. Said drawbar has upon each side a flange, upon which rest longitudinal plates attached to the framework, by means of which the drawbar is fastened to the same.

### Improved Scissors.

Horace S. Breeden, Barry, Ill.—A double shouldered catch is pivoted in a recess of one blade so that it may readily turn around in a small arc. On the other blade a projection is formed which rests on the shoulders of the catch, on one when the blades are closed and on the other when they are open. In order to hold the catch and projection locked, either when the blades are closed or open, a small spring is attached to the inside of the power arm of the lever blade, and caused to rest against the surface of the catch.

### Improved Gate.

William Flynn, Scotland, Mo.—This gate is made in two parts which are connected together and move simultaneously, one to the right and the other to the left. These are provided with truck wheels, on which they move back and forth on the top of a foundation. By suitable devices, on applying power to either part of the gate, the parts will move to either open or close.

### Improved Sun Dial.

George Mehr, Philadelphia, Pa.—This invention relates to a novel construction and notation of dial by which the correct time of day may be exhibited by the sun in a position inclined toward and convenient to the passer-by on the streets and thoroughfares of cities and towns, enabling all without difficulty or delay to perceive the solar time.

### Improved Car Brake.

John E. Worthman, Mobile, Ala.—This invention has in view to connect all the brakes of a train with a mechanism on the tender or on the truck of any car. It consists in the mode of tripping the spring pawl which locks the brakes, so that the latter will be at once allowed to assume a position out of contact with the wheels. It also consists in a novel mode of automatically ungearing a drum-winding worm wheel or pinion with an endless worm or screw which rotates it, so that the brake lever will be locked at a given point and the brakes operated with a given pressure.

### Improved Saw Swage.

Alonzo G. Rouse, Jacksonville, Fla.—Through the stock at the bottom of the recess are passed two transverse pins made of steel, one of which is perfectly round. The other pin has one flat side, and is so arranged that the same may be at such an angle with the inclined end of the recess as the inclination or taper of the tooth may require. The point of the saw tooth is placed between the pins, and blows with the hammer upon the stock will cause the pins to form small transverse grooves in the sides of the tooth. The swage is then adjusted to bring the point of the tooth between the inclined side of the flat ended pin and the inclined end of the recess, when one or more blows will bring the point of said tooth to the proper form, obliterating the grooves formed by the pins and finishing the point.

### Improved Soda Water Bottle Stopper.

Horace S. Carley, New York city, assignor to himself and Samuel W Saxton, same place.—This is an elliptical nozzle of a bottle for soda water with a seat at the inner end of the inside for a valve and a stopper of equivalent form, made of light material which will float on the liquid. A self-closing stopper is thus obtained that can readily be put in and taken out of the bottle to facilitate the cleaning.

### Improved Means for Propelling Canal Boats.

John R. Parks, Tolono, Ill.—This consists of an elevated toothed guide bar hung over the canal, for carrying a sliding clutch and pawl. It is connected, by a lever rod, with a crank of the driving shaft of an engine placed in a boat, so that the forward part of the crank shaft rotation moves the sliding clutch, while, by the rear part of the crank shaft rotation, together with the action of the pawl, the boat is propelled in a forward direction.

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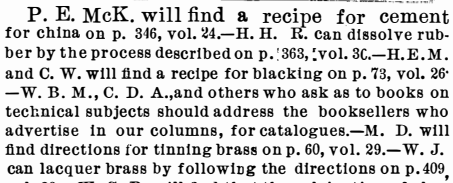


P. E. McK. will find a recipe for cement for china on p. 346, vol. 24.—H. H. R. can dissolve rubber by the process described on p. 363, vol. 3C.—H. E. M. and C. W. will find a recipe for blacking on p. 73, vol. 26.—W. B. M., C. D. A., and others who ask as to books on technical subjects should address the booksellers who advertise in our columns, for catalogues.—M. D. will find directions for tinning brass on p. 60, vol. 29.—W. J. can lacquer brass by following the directions on p. 409, vol. 30.—W. G. B. will find that the calcination of plaster is described on p. 399, vol. 29.—E. H. will find excellent directions for making sidewalks on p. 353, vol. 24.—J. L. B. and others are informed that the tunnage of the Great Eastern is 27,000 tuns.—G. W. C.'s question as to firing a moving gun has often been discussed in our columns.—J. W. should consult a manufacturer of turbines.—E. H. S. can polish stones by following the directions on p. 138, vol. 30.—B. F. G. does not state what the trouble is with his engine, and should consult an engineer.—J. W. H. will find on reference that we have frequently given rules for the areas of steam ports, which have been determined by extensive practice.—W. R. will find a description of the process of enameling iron vessels on p. 149, vol. 28.—W. T. H. will find a recipe for ink on p. 106, vol. 27.—L. N. E. will find directions for making a cheap telescope on p. 7, vol. 30.—F. B., who asks as to backing a train up an incline, does not give his name and address.—A. D. will find a recipe for making root beer on p. 138, vol. 31.

(1) W. H. S. asks: Is there any material other than plaster of Paris that will receive the fine lines of shading in electrotypes and retain them, to cast metal in, or is there any way of preparing plaster of Paris so that it will be hard and smooth enough for that purpose? A. We do not think of anything that will answer your purpose as well as plaster of Paris, which is commonly used. Try solution of alum in place of water.

(2) F. W. asks: 1. How can I measure the pitch of a propeller wheel? A. See p. 240, of this issue. 2. What size of wheel is suitable for an engine 12x12, for a tug boat, and what size of boat would be best for such an engine? A. Wheel 4 or 4½ feet in diameter, with a 6 to 7 foot pitch. The boat should be about 70 feet long.

(3) H. C. W. says: I recently saw a luminous fountain, light being reflected through the water. How was it constructed, and does it need the electric light to produce the effect? A. The apparatus is what is known as a vertical lantern, and may be constructed as follows: Into a small metallic box, open at one side, is placed a mirror at an angle of exactly 45°. The mirror should exactly fit the case, slanting from the upper left hand side to the lower right hand side, and facing the open side of the box. Into the top of the box is fitted a plano-convex condensing lens. The lantern is placed in the fountain, and the light from outside is thrown upon the mirror, which reflects it up through the condenser and so illumines the fountain. It is not necessary to use the electric light, as the lime light will fully answer the purpose; though the illumination will not be quite so brilliant, still it will be much more steady.

(4) J. B. G. asks: How can I make music by rubbing the fingers on the top edges of goblets? Will common glass do it? A. To produce the sounds you describe, select a large goblet, uniform in thickness and as thin as possible. Fill it, say, one third full of pure water. The glass and finger must be perfectly clean and free from grease. Dip the second finger in the water and immediately apply the under surface of the last joint to the upper edge of the glass, moving slowly around or to and fro with a somewhat firm pressure; to keep the finger and glass wet is essential to the success of the experiment. The vibrations produce a continuous monotonous sound, which may be varied by increasing or diminishing the quantity of water in the goblet.

(5) L. B. says: The entrance door of my dwelling is flanked by two cast iron columns 13 feet high and of 1 foot diameter; and finding that my two compasses and my galvanometer were inaccurate, I approached these columns with the compass and immediately the compass turned in such a way that it verified Oersted's law, showing the columns to be north at the base and south at the top. Then I found that the three hinges inside of the door were permanent magnets, and also that the large iron stove in the middle of the room (with the vertical pipes) was a magnet. Would it be possible to use the large magnets for experiments, and would they be strengthened by connecting them with a battery? A. The pillars, standing perpendicular to the earth, become polarized by its inductive influence. Their magnetism, however, is extremely feeble, in comparison with their dimensions. The cases cited are not an exception. We would not recommend the use of a battery in connection with the pillars, for the reason that such pillars (cast iron) when once magnetized could not be readily demagnetized, retaining for a time sufficient residual magnetism to endanger delicate pieces of mechanism (such as watches, etc.) by inductive influence.

I have made a magnet of nine plates of sheet iron 6 inches long and ½ inch broad, bent in the form of a horse shoe. The plates are covered with a thick wire. This magnet has only half the power of a solid magnet. How could I make it more powerful? A. By the passage of the current through the wires, every plate is converted into an individual magnet; and, as in this case, like poles are opposed to each other, the effect, if the plates were exact duplicates, would be *nil*, or nearly so.

(6) S. J. C. asks: What is your opinion in regard to bone dust and superphosphates for raising fruit, particularly berries, on sandy soil? I have muck and land plaster. Would it be advisable to compost the bone dust with either or both of these articles, or would superphosphate be better? A. If you use muck and land plaster, it would be better to use with them superphozphate instead of bone dust. The muck should be drawn out in the fall and allowed to stand in a heap one winter before using. The proportion of superphosphate used is optional, depending upon the soil, the time of year, etc. A good work to consult is "Agricultural Chemistry," by Johnson.

(7) J. B. T. says: A friend received an eagle that had been winged. The bird at time of reception answered fully the naturalist's description of the gray eagle. The next year, one white feather appeared where beak and feathers unite. The white has continued to increase each year, and for several years the bird was an unmistakable American or bald eagle. The time of transformation occupied perhaps eight or nine years, during which I frequently called attention to the subject. Are naturalists not a little at sea in this matter? A. The grey eagle (*haliœtus albicilla*) is an inhabitant of Greenland, and (according to Baird) has never been found in any more southern locality on this continent. Your specimen is undoubtedly the bald eagle (*haliœtus leucocephalus*) which, when young, has its entire plumage (including head and tail) dark brown; which changes to white as to head, tail, and upper and under coverts.

(8) A. S. D. says. In theory a hundred horse power engine would raise 3,300,000 lbs. of water one foot in a minute of time. Will you be kind enough to inform me what is the best result accomplished in practice with piston engines and pumps, and whether a greater percentage is obtained by rotary engines or not? A. The best results obtained with direct acting steam pumps, at a test made at the American Institute Fair in 1867, was an efficiency of a little more than 52 per cent of the power applied. A test of centrifugal pumps at the same place, in 1872, gave, as the best result, an efficiency of 68½ per cent. The tests of the two kinds of pumps, however, were conducted in such a manner that they are not strictly comparable.

(9) J. H. B. asks: Is there any known preparation that will effectually remove freckles without injury to the skin? A. There are several varieties of freckles. Your best plan would be to consult a physician, who can determine what is the best method and the best lotions to use.

(10) W. J. D. says: On p. 138, vol. 31, I find it asserted by V. A. that a supposititeus ball dropped down through a conjectural hole to the earth's center would "oscillate for ever from end to end of a diameter of the earth, provided that frictional or retarding media, such as air, etc., be excluded." A friend, with whom V. A. interchanged speculation, contended that "the ball, on arriving at the earth's center and losing its weight, also loses its momentum, and will come to rest without passing the earth's center." You "incline to V. A.'s opinion." If we suppose the earth to be a hollow sphere, and admit V. A.'s conjecture that the ball's momentum will carry it beyond the earth's center, the ball would be acted on by two forces, namely, its weight, or disposition to return to the earth's center, and its inertia, or tendency to keep on moving from it. Having passed the earth's center, a point might be reached where the two forces are equal, and the result then would be the rotation of the ball about its axis and its revolution around the earth's center; in other words, the law of the centrifugal and centripetal forces, which keeps the planets in their appointed orbits, would operate on the ball. We know that the tendency of the earth to fall toward the sun is counteracted by its rotation, which is the tendency to fly from the sun. Is it not analogical to suppose that the disposition of the ball to fly from the earth's center, checked by the inclination to return to it, would practically operate to produce rotation and revolution? A. The velocity acquired by the body in falling to the center of the earth, under the supposed conditions, would be just sufficient to carry it through to the other side, overcoming the attraction towards the center. When it reached the other side, it would come to rest, and then the attraction would cause it to return to the center. This is not an analogous case to that of the motions of the planets in their orbits.

(11) F. D. X. asks: In a cellar under a house there is a well about 16 feet deep, situated about 4 feet from the corner of the house. I want to conduct the water from the well to back part of house, to a pump. Pump is about 40 feet from well. How can it be done? A. Use a good house pump, with pipe suitable for its connections, and be careful to make all the joints of the suction pipe tight, and lay it with as few bends as possible.

(12) W. C. asks: Is the forward eccentric of a locomotive placed in an opposite position to that in which the back eccentric is placed? A. No.

Is the cylinder of a Baxter engine placed within the smoke box or within the boiler? A. In the boiler.

Can I enter a machine shop as a machinist after two or three years' study at Cornell University? A. Probably you would have to accept a subordinate position at first.

(13) C. H. M. asks: What composition is used in metallic cartridges, to make them take fire when struck? A. A mixture of equal parts by weight black sulphuret of antimony and chlorate potassa is used for the purpose of discharging ordnance by means of a percussion tube placed in the touch hole of the gun. For this purpose also a mixture of amorphous phosphorus and chlorate of potassa is used. The needle gun cartridge contains a mixture of chlorate of potassa and black sulphuret of antimony, or a compound containing fulminate of mercury. The following is a good preparation: 16 parts of chlorate potassa, 8 black sulphuret of antimony, 4 flowers of sulphur, 1 charcoal powder, are moistened with either gum or sugar water and about 3 drops nitric acid are added. In this country either the above or a mixture of chlorate of potassa and amorphous phosphorus are used.

(14) G. M. says: 1. In looking over the sizes of the Birmingham wire gage, I find that there is no common difference between the various numbers of that gage. How were these different sizes obtained originally? Were they just fixed on by haphazard, or is there a formula given, by which, if any one size be known, any or all the other sizes may be obtained? A. The gages appear to have been fixed at random, as you suggest, and the extensive use of the English gage in this country is no doubt due to its earlier introduction 2. Would it not be better to have a wire gage with a common difference between the numbers, say the 100th part of an inch, or some such number that any ordinary mechanic could comprehend? With the gages now in use, there are few men who know exactly what any number on the gage corresponds to on the foot rule. A. There would be many advantages from the use of a regular system, such as you mention. One such plan is already adopted by many of the manufacturers in this country, who use vernier callipers, and measure their work by inches and decimals, frequently working to thousandths of an inch.

(15) N. L. asks: Which runs with the least power, a large or a small journal of equal length? Does the friction double if the size of the bearing is increased to twice the diameter? Two of us have a little dispute; one claims that if the size of the journal is increased, the friction is also increased; the other says this is not so, and quotes your article (extracted from the *National Car Builder*) on p. 258, vol. 30, being a test of car axles, one having 3¼ inches bearing, the other bearing being 3⅛. The one with the largest bearing took the least power to propel. A. If the pressure on the two bearings is the same, and is not excessive in either case, and both are equally well lubricated and run at the same speed, the work of friction of the larger journal will be twice that of the other. In the experiment referred to, it is not improbable that, with the larger journal, the lubrication was so much more complete that the coefficient of friction was much less than in the case of the 3¼ journal.

(16) A. B. W. asks: How can asthma be relieved or cured? A. Consult the best regular physician in your vicinity. There is nothing in the treatment of asthma that is not known to the entire profession.

(17) E. C. B. says: It was lately stated, in a daily paper, that a goblet, perfectly sound in appearance, full of water, was placed on a table about two feet under a gas burner, by a girl who came in to light the gas. With one hand still resting on the goblet, she turned the stopcock with the other, allowing the gas to escape for an instant. Then, touching the match, the gas flashed, and the goblet instantly flew to pieces. Can such an accident be possible? A. The tale bears evidence of being more wondrous than true.

(18) F. W. M. asks: In bringing water from a spring where the descent will be gradual for the entire distance, would anything be gained by starting from the spring and running a few rods with a larger pipe than would be used in the remainder of the distance? Would any more water come through a half inch pipe if the first few rods were ¾ inch pipe, than would come through if the entire course were only ½ inch? A. There would be a slightly increased delivery by the adoption of the larger pipe; but it would probably be very slight.

(19) F. S. C. asks: Is water compressible at 35° Fah.? A. Slightly.

Are there any jig saws which move the board being sawn, automatically, to cut out the patterns? A. No.

Are there any engines with more than two cylinders? A. Yes.

Of what is tobacco composed? A. Some of its constituents are: Nicotine, nicotianine, resin, albumen, gluten, gum, nitrates, salts of potassium, woody fiber, water, and ashes.

What is the size of the largest engine in the world? A. Cylinder about 108 inches by 14 feet stroke.

(20) S. H. R. says: I have some old gold, taken off a cane head; and inside, the gold is covered with soft solder. What will take it off? A. Hold it over a hot gas or alcohol flame, sufficient to melt the soft solder but not to affect the gold. When the solder is about melted, give the head of the cane a quick jerk, when the solder will all drop out.

(21) T. O. Z. asks: Is the gas from a gasoline machine more unhealthy to burn than city or coal gas? A. It would be necessary to have the gases analyzed, and see which contained the greatest amount of incombustible matter, before this question could be answered.

(22) F. E. says: In your patent law book it is stated: "When the air is exhausted from a pump tub (usually done by means of a piston), the pressure the atmosphere will cause the water to rise in the tube to a hight of 30 feet." 1. Would another arrangement, something like a blacksmith's bellows, fixed on the top of the tube, withdraw the air out of the tube and consequently raise the water? If so, what should be the size of the bellows in proportion to the tube? A. Yes. Proportion of bellows to pipe should be about the same as that of a common pump. 2. What force (given in pounds) would be required to withdraw the air out of the tube in this way, in proportion to the weight of water thus raised? A. The work would be the same as that required to lift the weight of water in the pipe to the required hight. 3. Does the water rise as quickly as the air is exhausted? A. Yes. 4. Would there be any difference in regard to the size of the pump tubes? A. It would take longer, with the same apparatus, to exhaust the larger of two tubes.

(23) B. says: I have a cloth awning which has been in use two years. This summer, small black spots began to appear on it and holes appeared in the center of each one, making the awning look as if a lot of scattering shot had been put through it. The spots seem to be caused by a rotting of the cloth, which breaks away easily. How can I stop it? A. If not too late to save it, try the plan of soaking it in strong brine.

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(24) U. H. says: I want to make a collection of insects. How must I prepare them? Must the box I put them in be airtight? A. The necessary information required by you can be obtained by consulting "Packer's Guide to the Study of Insects," or J. G. Wood's "Insects at Home."

(25) E. H. M. says: Spirits, such as Holland gin and Scotch and Irish whiskey, if allowed to remain in the original cask for 6 or 12 months, becomes tinged or colored from the wood, which deteriorates the market value, perfectly white being the desirable hue. What, if anything, will remove the objectionable color without deteriorating its value? A. The color is an amber tint obtained from the cask, which we were not before aware affected the value of the spirits. The astringent properties are also increased by the same means, but we know of no method to make the liquor colorless, except re-distillation.

(26) M. F. M. asks: Is there any instrument wherein the magnetic needle is replaced by other means, equally effective and not subject to local attraction? A. No.

(27) J. J. S. asks: Can I use a portable engine, of a small size, for heating a store room 30 feet square by steam, and also run the engine for half an hour per day? A. The boiler of a portable engine is not usually very efficient, except with the forced draft due to the blast. A boiler made especially for heating purposes would probably answer better. Subscriptions to the SCIENTIFIC AMERICAN are received every day in the year.

(28) I. T. H. asks: Will the United States government register foreign built iron or wooden ships? Are there any lines of ships (trading to England) built in England, owned in America by Americans, and registered in America? A. No foreign built vessel can be registered in the United States. There are some steamship lines that are largely owned in this country, but the vessels sail under a foreign flag.

(29) J. asks: How can I build an ice house to hold eight tuns of ice? A. Erect a building above ground 17 feet square on the exterior; make an interior compartment in the center of the same 6 feet square on the inside thereof; make both the interior and exterior walls 12 inches thick, by setting up 2 by 10 inch studs, about 2 feet apart in the interior walls and 3 feet apart in those of the exterior, and then cover the exterior and interior of each wall with one inch boards with tight joints, if tongued and grooved so much the better. The outside frame will require a foundation 3 feet deep in the ground; therefore excavate the interior and make the floor of the ice house say 2½ feet below the surface of the ground. Make the hight on the interior 8 feet in the clear above said floor, and construct a strong level ceiling of boards secured to proper cross bearers. Then fill in the two frames with dry saw dust between the interior and exterior boarding, and lay similar filling upon the ceiling boards to a hight of 12 inches. Pave the floor with cement concrete graded lowest at the center, and provide a good drain to carry off the water. Put a high pitched ordinary roof over the ceiling, and provide a tube from ceiling to exterior of roof for ventilation of interior of ice room. Make exterior and interior doors in these walls, lined with canvas and filled with sawdust. Fill the interior chamber with the ice, laid upon a few rails to keep it from the bottom, packing close in very cold weather, and throw water upon it occasionally to freeze it together. You will then have a cube of ice of 7 feet, which will contain something more than 8 tuns, and which will have the protection of a 3 feet air chamber or passage all around it. This 3 feet chamber will be your cold closet, in which you can preserve your meats etc., in summer, care being taken to have the door to it opened as little as possible. This also answers E. S.

(30) J. A. H. asks: What will save clothing from moths better than gum camphor or cedar wood? A. There is nothing better.

What will remove (without injury to the skin) the small worms or black heads in a person's face? A. "The treatment requires the employment of such means as are calculated to stimulate the skin gently, and excite it to the due performance of its proper functions. The parts affected should be saturated with soap and thoroughly washed; they should then be rubbed briskly with a rough towel, until the skin be felt to glow, and this should be repeated twice in the day. The immediate effect of this treatment may possibly be a red and patchy state of the skin, which will speedily pass away It would be well also to extend the ablutions and frictions to the entire body, for the appearance of the disease in one part is indicative of a generally torpid action of the skin. Cold bathing and sea bathing are beneficial. In severe cases, bichloride of mercury in an emulsion of bitter almonds has been used.—*Wilson "On Skin Diseases."*

(31) A. L. D. asks: Is chronic nasal catarrh curable? A. Sometimes it is cured. Consult Niemeyer's "Practical Medicine," vol. 1, pp. 286—282.

(32) A. P. asks: How can I look at the sun with a common spy glass without hurting the eye? A. Place a disk of dark or smoked glass between two paper rings inside the eyepiece cap.

(33) C. A. S. asks: What kind of machine shop should I go into in order to become a master mechanic? Ought I to go to college first? A. Go to the one that does the greatest variety of work. Very few master mechanics, we imagine, have been through college.

(34) V. A. asks: Is the moon's orbit round the earth in the same plane as the orbit of the earth round the sun; and if not, what is its greatest divergence, expressed in degrees? A. The moon's orbit is inclined to the ecliptic 5° 8′ 48″. 2. I have heard it asserted that the moon shines with great brilliancy during the arctic winters, but fail to account for it otherwise than by a departure of at least twenty degrees in the lunar orbit from the plane of that of the earth. A. The moon's greatest distance is 253,263 miles, least 221,436, mean 233,885. The polar winter alternates with a fortnight of moonlight and a fortnight of darkness for six months.

(35) J. C. H. asks: What is the best non-conductor for filling the walls of a refrigerator? A. Air, probably.

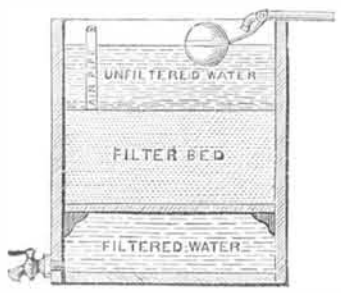
(36) E. L. M. asks: How is spermaceti purified? A. This substance occurs mixed with oil, filling large cavities in the head of the sperm whale. The oil is removed by pressure, and finally by washing in a dilute solution of potassa, and the spermaceti is obtained as a white solid, which fuses at 120° and crystalizes on cooling, in beautiful, broad, pearly plates.

(37) J. M. asks: What do actual and nominal horse power of a steam engine mean? A. Nominal horse power is calculated from assumed conditions, generally very different from the real conditions, upon which the actual horse power depends.

(38) A. B. C. asks: Is there a book that gives instructions on casting toys, figures, etc., in plaster of Paris? A. We do not know of any such work.

What is Parian marble? A. Parian marble is an unglazed statuary porcelain, similar to English porcelain, but more difficultly fusible, containing less flux and more silica. The color is a very slight yellow; the surface is waxlike.

(39) G. T. O. says: I ask your opinion in regard to the construction of a water filter, and would like to know the best possible form. I want one that will hold about 3 gallons. What shall I put in it, and how shall I place it? A. The engraving represents a very good filtering apparatus, manufactured in England; you can have one like this made of any desirable size. The best material for the box would be soapstone; the next best material, iron. Mott's cast iron tank plates come of a convenient size—18x18 inches and 9x18 inches—these may be galvanized or coated with slate paint. But Passaic water cannot be purified by filtering alone; the following (which we wrote in 1866 in answer to a correspondent in reference to the water supplied to Philadelphia) will also apply in this case: "If our correspondent is willing to take the trouble, he may obtain pure water by distilling, filtering, and aerating. Get a simple still to set on a cooking stove, and distil all the water intended for drinking, then filter it through freshly burned charcoal to remove the volatile odors that come over, and finally agitate it in the atmosphere so that it may reabsorb its supply of air to make it sparkling and palatable. A simpler process for obtaining pure water is to melt ice. This process is employed by some of the most eminent physicians in this city for their own families, to avoid the danger of lead poison from their water pipes."




(40) J. S. B. asks: Can nitric acid of a specific gravity of 1·94 be made, and would it be anything short of anhydrous nitric acid? Books of reference place the specific gravity, obtained by evaporating the acid to its greatest density, at 1·521. A. To our knowledge there is no nitric acid of so high a specific gravity used either in the arts or the laboratory.

(41) B. A. S. says: I wish to make a telescope of four joints. How long should each joint be, and what sized lens shall I put in, to see at the distance of 15 or 17 miles? What kind of material should it be made of? My object lens will be about 2½ inches. A. You will need a foot lathe with traversing mandrel, in order to chase screw threads properly in thin brass tubes. See previous answers to correspondents for construction of eyepieces.

(42) A. D. C. B. says: 1. A friend of mine says that whisky can be made without being distilled? Is this so? A. Yes. 2. Is it more unwholesome than the other sorts? A. No. All are equally deleterious.

(43) D. McD. says: I send you a plan for the multiplication of the effects of two or more air-pumps, founded on the theory that if an air pump that will exhaust a receiver to 1-100 of the density of common air be placed under a receiver, already similarly exhausted, the smaller receiver will equal 1-10,000 the density of the common air. A. We do not see that any advantage is obtained by this multiplicity of pumps.

(44) S. says: A segmental brick arched bridge of 27 feet span by 8½ feet rise is about to be erected over a creek at Poughkeepsie, N. Y.; it crosses the same at an angle of 52° 10′, making the distance on the skew about 34 feet. Do you know of any brick or stone bridges placed at or near the above angle to be built in horizontal courses or as you would build a rectangular bridge? Is it possible to build one in horizontal courses at that angle with any certainty of the arch sustaining itself for an indefinite period? A. We do not know of any skew bridges built in horizontal courses, nor is it desirable to so build them, as such construction is unscientific and without guaranty of permanence. Edward Dobson, C. E., in his "Treatise on Masonry and Stone Cutting," published by Weale, has exemplified fully the nature of the twist required in such arches. A brick arch, when oblique, as you require, would be best built by laying the courses at right angles to the sides of the centering, depending upon the latter entirely for the shape of the soffit; the strains would then be properly received upon the abutments, and the bridge would be secure.

(45) J. P. & Co. ask: What cement will do to fill a corn burr? A. Try a mixture of dust from powdered French burr stone, alum, and water. Back up the stone with plaster of Paris. Your cheapest plan, however, may be to send the stone to a manufacturer to be repaired.

(46) A. R. asks: Will coal tar applied to fence posts before setting render them much more durable? A. Yes. It will render them insect and damp proof. It should be laid on hot.

(47) L. M. says: I have a hop vine which climbs around the pole from east to west; and near by are pole beans which turn from west to east. What is the cause of the difference? A. It is a principle of plant life for plants to wind themselves upon the first means of support, the manner of which is dependent upon no known law.

Is there anything that I can use to get coal marks off my face? A. We know of no preparation especially adapted for that purpose.

What do the terms "specific gravity" and "equivalent" mean? A. Look in Webster's "Dictionary."

(48) A. F. C. says: I have a 3 inch achromatic object glass of 48 inches focus, and am desirous of constructing a celestial eyepiece of as high a power as it will stand for use in a telescope. How must I arrange it? A. Rule for Huyghenian eyepiece of any power: Divide the focal length of object glass by the power required. Quotient doubled = focus of field lens. One third of focus of field lens = focus of eye lens. The two lenses are separated two thirds the focus of field lens. Both should be plano-convex, with curved side toward objective. Eye lens should be about half the diameter of field lens. A diaphragm is placed at the focus of the eye lens. Your previous enquiry was answered on August 1.

(49) H. B. C. asks: What food gives the most nutriment to the brain? A. No one material can be considered best; that suiting at one time may not at another. That food is best for the brain which is best for the body, producing *mens sana in corpore sano*.

If heavy cannonading causes rainfall, what is the operation of it? A. It has been proved an absurdity.

Is the expression "the cold is too great for snow" true or not? A. The expression is not true, some of the heaviest snowstorms in this latitude having taken place in the very coldest weather.

(50) W. G. L. says: We are building a press; the crank shaft is 6 inches in diameter, with crank in the middle of it of 4 inches throw. Our foreman says the key seat for the driving wheel or pinion on the shaft should be upon the same side of the shaft with the crank, as it would give advantage of leverage and less stress upon the key. I think it makes no difference. Who is right? A. It makes no difference where the key is. The key seat, however, is generally cut in such position as is most convenient to chuck the shaft to cut the key seat.

(51) J. J. S. asks: What book would you recommend for the use of a machinist, possessing an ordinary common school education? I wish to study the use of steam, especially applied to marine engines. A. Get Bourne's "Catechism" and "Recent Improvements of the Steam Engine," and Wilson's "Treatise on Boilers."

(52) G. B. Q. says: I append the principal dimensions of two pairs of compound surface condensing engines, which I will call No. 1 and No. 2. Engine No. 1 is rightly proportioned, and engine No 2 is to be built in the same proportions, with a reduction of 3 inches in diameter of high pressure cylinder, and a reduction of 6 inches in low pressure cylinder, and of 4 inches in the stroke; but it is to carry higher steam. Should all the parts of No. 2 be reduced in proportion as the cylinders are reduced, and do you consider the surface condenser for No. 2 sufficient in proportion to No. 1, the steam being condensed on outside of tubes in condenser of No. 1, and on inside of tubes in condenser of No. 2? No. 1 has the advantage of sea water at a much lower temperature, while No. 2 has river water for condenser, the difference being about 8° higher in the river.

| | Engine No. 1. | Engine No. 2. |
|---|---|---|
| Diam. of high pressure cylinder | 33 inches | 30 inches |
| Diam. of low pressure cylinder | 66 " | 60 " |
| Length of stroke | 36 " | 32 " |
| Revolutions | 56 | 60½ |
| Tubes in surface condenser | 3,200 | 1,500 |
| Length of each tube in surface condenser | 5 ft. 6 in. | 7 ft. |
| Diameter of tubes outside ⅝ inch, inside ½ inch. | | |
| Pressure of steam per square inch | 60 lbs. | 90 lbs. |
| Steam cut-off at | 25 inches | 25 inches |

A. From simple examination, we should say that the proportions of No. 2 condenser are rather small, if No. 1 is just right. We think, however, that the proportions of No. 1 engine could be improved. Of course, if you think of building an engine of this size, you should entrust the design to a competent engineer.

(53) W. S. asks: What will best cement glass, so as to stand blood heat? A. Try diamond cement.

(54) H. C. N. F. and F. G. H. call attention to an error in our answer No. 28, p. 202, current volume. The speed of the boat down stream should of course be 16 miles per hour.

(55) C. I. asks: Why is not the power of air utilized? Is it not preferable to steam, cheaper, and safer? A. Air engines of any considerable power, as at present constructed, are very bulky.

Why is not electricity used as a motor? A. It is too expensive to compete with steam, on a large scale.

What has become of the one rail project for railroads? A. The inventor is, by last advices, trying to introduce this system in the South.

(56) A. F. L. W. asks: 1. How can I tell a high from a low pressure engine? A. As these terms are ordinarily used, a low pressure engine has a condenser, and a high pressure engine exhausts into the air. 2. How can I tell the horse power of any engine? A. It can only be ascertained with perfect accuracy by means of experiments. We have frequently given rules for its approximate determination.

(57) C. F. T. asks: How hot can water be heated? A. When the barometer indicates 30 inches, boiling point of water is 212° Fah. But as the pressure decreases, the boiling point of water is proportionately lower, and *vice versa*.

Which will freeze in the shortest time, hot or cold water, when both have been boiled? A. Cold water.

(58) W. L. asks: A friend and I had a dispute on the cause of the different seasons. He says that they are caused by an eccentric motion of the earth, and I claim that they are caused by the axis of the earth being inclined 23½° out of perpendicular. Who is right? A. You are right.

(59) E. B. W. asks: Into how many orders are the various curves divided, and upon what principle is the division made? Do the conic sections constitute a distinct order? What curves belong to each of the various orders? A. You will find this matter discussed in any good text book of analytical geometry. It would occupy too much space, and is too strictly mathematical to justify its consideration in these columns.

(60) R. O. B. asks: Who saved the Great Eastern during her first outward voyage? A. Mr. Hamilton E. Towle recovered a claim against the company for his exertions on the occasion of the disaster to the Great Eastern.

What is the best work on geometrica drawings? Is Rheim's book a good one? A. Professor Warren's and Minifie's books are good.

Can one of ordinary ability acquire sufficient knowledge of drawing in 6 months to be able to enter a drafting room? A. Yes, in an humble position at first.

Is there a rule by which a person can find the radius when the arc and chord are given? A. We know of none.

(61) A. R. asks: What machinery is needed to propel a boat by electro-magnetic action? A. There is no such machinery in the market. If you write to a maker of philosophical apparatus, or advertise, you may possibly be able to have a machine constructed.

(62) J. P. P. asks: Where can I get drawings of engines, low and high pressure and compound, with the details in full? A. N. P. Bergh's work on the marine engine, with appendix on compound engines, gives details of many English engines. Weissenborn's works give details of American engines, condensing and non-condensing, but not of compound engines.

(63) J. S. P. asks: What is the best mode or manner of improving the acoustics of public buildings, checking the echoes, etc.? Are wires the best remedy? If so, of what size, and how far apart should they be, in a room 79x50 feet, with a ceiling 19 feet overhead. There are 21 feet of rising seats and no pulpit; the speaker stands upon the floor. The sound of his voice echoes and reverberates to that extent that it is extremely difficult to understand a word he says. What is the scientific remedy? A. Try the wires on the vertical wall opposite the speaker; place them to run horizontally 6 inches out from the wall and 6 inches apart. If this does not sufficiently break the force of the echo, place a similar series in the two side walls extending from the back of the church where the speaker stands to the center of the depth of the building. Your ceiling is entirely too low for so large a room.

(64) W. C. says: I have a cistern in which the water smells so badly that it is impossible to wash with it or to use it in any way. My house is surrounded by water maple and horse chestnut trees. The cistern has lately been thoroughly cleaned, and has also had a bushel of charcoal put into it. A flat stone has usually covered the mouth of it, making it airtight to a certain extent; I have had the stone removed entirely, but still the water is unfit for use. Can you give me any remedy for the trouble? A. Are you sure that there is no drain that runs near it or leaks into it, or a defective cover or crown that admits of the drainage of surface water into it? Are your roofs clean and covered with the usual material? Is there an overflow pipe, and may not surface water enter by some break and obstruction in that? These points you ought to be sure of; because, if you have a clean, tight cistern properly ventilated, you ought to have good water.

(65) J. A. C. asks: In a steam hammer, what would be the diameter and stroke of cylinder, and the weight of hammer on end of piston rod, for ordinary ship work? Could I elevate the hammer by a spring pole, and use steam on top only? A. Cylinder 4 inches diameter and 12 inches stroke. Weight of hammer, 250 lbs. It would be best to raise the hammer by steam.

(66) C. W. McC.—Try a weak solution of ammonia.

(67) P. F. D. asks: How is the dull black, used for optical instruments, made? A. Dissolve a drachm bichloride of platinum in one ounce of water and add a grain nitrate of silver. Clean, polish, and warm the brass. Apply the solution with cotton wool rubbing until dry.

(68) G. W. C. says: I would like to ask H. L. M. how he could straighten a rifle barrel from the outside if the bore was not in the center? Rifle barrels are usually welded up from a flat bar with a small hole in the center, or as near the center as can be but never exactly in it. After a barrel is forged, bored, and polished, it is straightened from the inside (not outside) then a circle is struck on each end, and it is finished from those circles from end to end. Before a barrel is straightened the bore has many short crooks, some not over 3 inches long, and perhaps some less. Those crooks cannot be taken out with the wooden blocks and vise that H. L. M. tells I. G. N. to use. A rifle barrel, to shoot correctly, must be perfect for a foot at the muzzle, but it is not so important for the balance of the way. It is not absolutely necessary to have a shot gun barrel perfectly straight to make a good shooter. There is more difficulty to make a good shot gun than a good rifle. The best of gunsmiths cannot make a good shot gun every time, and they cannot tell what the trouble is

**MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated:**

A. K.—No mineral has been received under this name —C. I.—Only one parasite was found in the box. By use of the microscope, it was found to resemble a common red scale bug, devoid of legs; but whether these were wanting naturally or were broken off, we cannot say. No description could be found to agree with it, and possibly it is unknown. The contents of the box were in a very poor condition when received. When Kansas and the adjacent States and Territories become as thickly settled as the Eastern States, there will be no more danger of locusts there than here.—W. A. S.—The plant or vine sent by you is the climbing wild hemp (*mikania scandens*), very common in the middle portion of the Southern States. We know of no law or rule for the direction of the spiral of a climbing plant.

N. S. asks: How can I put solder up in small bars, the size of a knitting needle, without molds? —A. D. asks: How can I make soda water?—O. C. H. says: I have a lot of shingles, with sap that turns blue, black, and green after a little exposure to the weather. How can I prevent this?—F. S. asks: How can I make black ink powder?

## COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Aniline Black. By M. B. C. G.
On the Texan Stinging Lizard. By T. L. W
On Type Setting Machines. By ——
On the Recent Rifle Match. By ——
On a Nut for Mr. Darwin. By J. B. H.
On Cross Cut Saws. By A. H. I.

Also enquiries and answers from the following:

J. W.—F. L. Y.—W. S.—J. S. H.—R. L.—H. H.—C. B. A.—C. D. Q.

## HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc. will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail the writer's address is given.

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Hundreds of enquiries analogous to the following are sent: "Who sells the Leeds heater? Where is the cheapest and best shop to get small metallic articles manufactured? Who buys gold, silver, or copper coins? Who publishes books on tanning? Where can artesian well machinery be obtained? Where can I purchase a good horse power well drill? All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

# Index of Inventions

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## APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,910.—PAPER FOLDER.—C. Chambers, Jr. Dec. 2.
30,955.—CUTTING BUTTON HOLES.—F. C. Leypoldt. Dec. 2.
30,929.—TOBACCO CUTTER.—W. H. Pease. Dec. 2.
30,931.—SPINNING FRAME CYLINDER.—R. Plews. Dec. 2.
30,945.—VEGETABLE PARCHMENT.—X. Kacheski. Dec. 2.
30,993.—WOOD PLANING MACHINE.—H. D. Stover. Dec. 2.

## EXTENSION GRANTED

30,076.—WOOD SAW FRAME.—W. H. Livingston.

## DISCLAIMER.

30,076.—WOOD SAW FRAME.—W. H. Livingston.

## DESIGNS PATENTED.

7,755.—ORNAMENTING GLASS.—W. Beck, Pittsburgh, Pa.
7,756.—CAR WHEEL.—W. A. Miles, Copake Iron Works, N. Y.
7,757.—BURIAL CASKET.—G. M. Rinehart, Allegheny, Pa.
7,758.—TABLE GLASS.—L. Stoehr, Pittsburgh, Pa.
7,759.—SPOON HANDLES.—G. W. Hull, Wallingford, Conn.
7,760.—HARNESS ROSETTE.—F. Reynold *et al.*, Newark, N. J.
7,761.—GROCER'S CAN.—C. C. Warren, Toledo. O.
7,762.—OMNIBUS.—A. Wright, St. Louis, Mo.

## TRADE MARKS REGISTERED.

1,978.—CATARRH REMEDY.—N. S. Coon, San F'cisco, Cal.
1,979.—CANNED FRUIT, ETC.—G. M. Howell, Trenton, N. J.
1,980.—SUGAR.—Matthiessen & Wiechers Refining Co., Jersey City, N. J.
1,981 & 1,982.—BREAST PUMPS.—O. H. Needham, N. Y. city.
1,983.—GLOVES.—Wirbel *et al.*, New York city.
1,984.—AERATED BEVERAGE.—J. R. Champlin, Laconia, N. H.
1,985.—INSECT POWDER.—H. S. Danziger, New York city.
1,987.—TIMBER, ETC.—H. A. Frink, Baltimore, Md.
1,987.—CIGARS.—J. W. McCarthy, Independence, Iowa.
1,988.—BOOTS, ETC.—Phipps & Co., Cincinnati, O.
19,89.—STEAM INJECTOR.—Rue Manf. Co., Philadelphia, Pa

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On granting the Extension ..... $50
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On application for Design (7 years) ..... $15
On application for Design (14 years) ..... $30

## CANADIAN PATENTS.

### LIST OF PATENTS GRANTED IN CANADA SEPTEMBER 21 to 25, 1874.

3,820.—W. G. Entrekin, Philadelphia, Philadelphia county, Pa., U. S. Improvements in machine for burnishing photographs, called "Machine for Burnishing Photographs." Sept. 21, 1874.

3,821.—J. T. Waring, Yonkers, Westchester county, N. Y., U. S. Improvement in the treatment of felted, woven, and spun fabrics, called "Waring's Improved Treatment of Felted, Woven, and Spun Fabrics." Sept. 21, 1874.

3,822.—J. H. L. Wilson, Sherbrooke, P. Q. Improvements on crib attachments to bedsteads, called "Wilson's Crib Attachment for Bedsteads." Sept. 21, 1874.

3,823.—D. Dodge, Keeseville, Essex county, N. Y., U. S. Improvements on machine for cold-finishing horse shoe and other nails, called "Dodge's Cold-Finishing Nail Machine." Sept. 21, 1874.

3,824.—W. A. Springer, Marlborough, Middlesex county, Mass., U. S. Improvements on trimming or cutting attachments for sewing machines, called "Springer's Trimming or Cutting Attachments for Sewing Machines." Sept. 21, 1874.

3,825.—W. H. H. Bowers, Franklin, Simpson county, Ky., U. S. Improvements on apparatus for propelling street cars by compressed air, called "Bowers' Apparatus for Propelling Street Cars." Sept. 21, 1874.

3,826.—J. L. Clark and J. Stanfield, 5 Westminster Chambers, Victoria street, Westminster, Eng. Improvements on floating docks and pontoons, called "Clark & Stanfield's Improved Floating Dock." Sept. 21, 1874.

3,827.—T. P. Ford, Brooklyn, Kings county, N. Y., U. S. Improvements on ships' berths, called "Ford's Self-Balanced Berth." Sept. 21, 1874.

3,828.—M. L. Barclay, township of Williamsburgh, Dundas county, Ont. Improvements on washing machines, called "Barclay's Washer." Sept. 21, 1874.

3,829.—J. R. Whittemore, Chicopee, Hampden county, Mass., U. S. Improvements on horse hay rakes, called "Whittemore's Horse Hay Rake." Sept. 21, 1874.

3,830.—D. Rousseau and W. C. Smith, New York city, U. S. Improvement on electric signals and signal lamp locks, called "Rousseau's Improved Electric Railway Signal." Sept. 21, 1874.

3,831.—J. Lawrence, Palermo, Halton county, Ont. Improvement in reaping and mowing machines, called "Lawrence's Improved Shoe for Reapers and Mowers." Sept. 21, 1874.

3,832.—W. C. Stone, Almonte, Lanark county, Ont. Improvements on brush dusters, called "Stone's Duster." Sept. 21, 1874.

3,833.—E. F. Walker, Sherbrooke, P. Q. Improvements on gridirons, called "Walker's Dominion Double Gridiron." Sept. 21, 1874.

3,834.—O. W. Taft, New York city, U. S. Improvements on steels for sharpening knives, called "Taft's Steel for Sharpening Knives." Sept. 21, 1874.

3,835.—W. Foulis, Glasgow, Lanark county, Scotland. Improvements on machinery for charging retorts, called Foulis' "Retort Charging Apparatus." Sept. 21, 1774.

3,836.—G. S. Walker, Erie, Erie county, Pa., U. S. Improvements on washing machines, called "Walker's "Washing Machine." Sept. 21, 1774.

3,837.—C. C. Gregory, Frederickton, New Brunswick, Improvements on exhaust regulators, called "Gregory's Exhaust Regulator." Sept. 21, 1874.

3,838.—J. N. Lander, Concord, N. H., U. S., assignee of T. M. Farrington, same place. Mechanism for raising and revolving the driving wheels of a locomotive steam engine, called "Farrington's Locomotive Eccentric and Valve Adjuster." Sept. 21, 1871.

3'839.—H. G. McMicken, Winnepeg, Mass., U. S. Improvements on a machine for breaking ice, called "McMicken's Improved Ice Pick." Sept. 21, 1874.

3,840.—C. H. Farley, Portland, Cumberland county, Me., U. S. Improvements on locomotive fire boxes, called "Farley's Locomotive Fire Box." Sept. 21, 1871.

3,841.—S. Hoyt, Magog, Stanstead county, P. Q., assignee of S. Rexford, same place. Improvements on staglngs, called "Rexford's Improved Staging." Sept. 21, 1874.

3,842.—J. Inglis, Montreal, Montreal District, P. Q. Improvements on weighing scales, called "The Compensating Compound Beam Scale." Sept. 21, 1874.

3,843.—H. Pryor, Woodstock, Oxford county, Ont. Improvements in milk cans, called "Pryor's Improved Milk Can." Sept. 21, 1874.

3,844.—M. A. Goldstone, Toronto, Ont., assignee of T. Mepham, same place. A compound or composition of matter for cleansing or purging boilers from the coating or scale which collects on the inside thereof, called "The Britannia Scale Purgative." Sept. 21, 1874.

3,845.—J. E. Landers, New Bedford, Bristol county, Mass., U. S. Improvement in flower pots, called "Improvements in Flower Pots." Sept. 21, 1874.

3,846.—C. C. Wolcott and W. W. W. Wood, Washington, D. C., U. S. Improvements on generating and applying Motive Power," called "Wolcott's Motive Power." Sept. 21, 1874.

3,847.—G. J. Baker, Oakville, Hatton county, Ont. "Baker's Dominion Carriage Rub Iron." (Extension of No. 16.) Sept. 21, 1874.

3,848.—O. T. Shafer, London, Middlesex county, Ont. Improvements on land rollers, called "Shafer's Improved Land Roller." Sept. 21, 1874.

3,849.—G. Scott, Montreal, P. Q. Improvements on a clothes line puller and fastener, called "Scott's Clothes Line Lock Pulley." Sept. 21, 1874.

3,850.—J. P. MacLean, Brooklyn, Kings county, N. Y., U. S. Improvements on clasps for uniting the fronts of corsets, corselets, or stays, called "MacLean's Improved Corset Clasp." Sept. 21, 1874.

3,851.—D. Lockhead, Hochelaga, Hochelaga county, P. Q. Improvements on mowing machines, reaping machines, and combined mowing and reaping machines, called "Lockhead's Combined Mowing and Reaping Machine." Sept. 21, 1874.

3,852.—T. Haynes, Kansas, Jackson county, Mo., U. S. Improvement on lubricators for railway car and other axles and journals of shafts, called "Thomas Haynes' Lubricating Oil Box." Sept. 21, 1875.

3,853.—J. L. Sprague, Hermans township, St. Lawrence county, N. Y., U. S. Improvements on churns, called "Sprague's Churn." Sept. 25, 1874.

3,854.—H. Wellington, New York city, U. S. Improvements in hydrocarbon burners, called "Wellington's Coronet Burner." Sept. 25, 1874.

3,855.—J. Currie, St. Thomas, Elgin county, Ont. Improvements on gang plows, called "Currie's Improved Wooden Frame Gang Plow." Sept. 25, 1874.

3,856.—H. Carter, Malahide, Elgin county, Ont. "Carter's Improved Ditching Machine." (Extension of No. 89.) Sept. 25. 1874.

3,857.—E. Lavigne, Quebec, P. Q. "Une balangoire indépendante." (A swing. Extension of No. 37.) Sept. 25, 1874.

3,858.—A. Kenedy, East Zarra, Oxford county, Ont. "Kenedy's Flexible Roller." (Extension of No. 26.) Sept. 35, 1874.

3,859.—B. F. Ulmer, Savannah, Chatham county, Ga., U. S. Improvements on a medical compound, called "Dr. Ulmer's Liver Corrector or Vegetable Aperient." Sept. 25, 1874.

3,860.—I. Gordon, St. Catharines, Lincoln county, Ont. Improvements in a machine for grading and separating wheat, called "Gordon's Combined Wheat Grading and Separating Machine." Sept. 25, 1874.

3,861.—G. Smith, Clinton township, Lincoln county, Ont. Improvements on a machine for driving circular saws or cutting boxes, called "Smith's Adjustable Jack." Sept. 25, 1874.

3,862.—C. Shulty, Preston, Waterloo county, Ont. Improvements in wheels for carriages, called "Shulty's Improved Wheel." Sept. 25, 1874.

3,863.—G. R. Shepardson, La Crosse, La Crosse county Wis., U. S. Improvements in machine for bundling laths, called "Shepardson's Lath Bundling Machine." Sept. 25, 1874.

3,864.—P. Huff, East Gwillimburg, York county, Ont. Improvements on a machine for restraining breechy cattle, called "Huff's Improved Poke." Sept. 25, 1874.

3,865.—J. Parker, Toronto, York county, Ont. Machine for heating and applying wax to thread, called "Parker's Improved Wax Thread Heater." Sept. 25, 1874.

3,866.—W. P. Tenny, Boston, Suffolk county, Mass. Improvements on disinfectant packages and receptacles for containing disinfecting powder and other powdered and granulated substances, called "Tenny's Disinfectant Package." Sept. 25, 1874.

3,867.—J. M. Gustin, Wilmington, Clinton county, O., U. S. Improvements on combined walking and sulky plows, called "Gustin's Combined Sulky and Walking Plow." Sept. 25, 1874.


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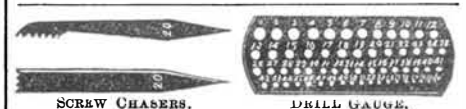

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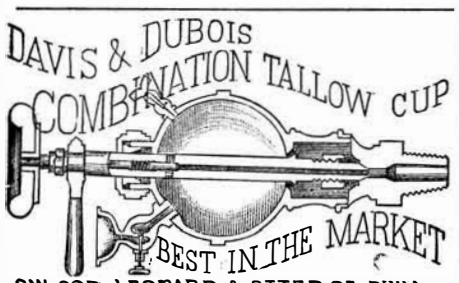


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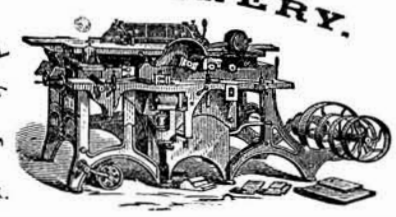

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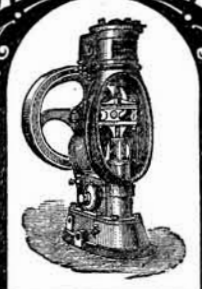


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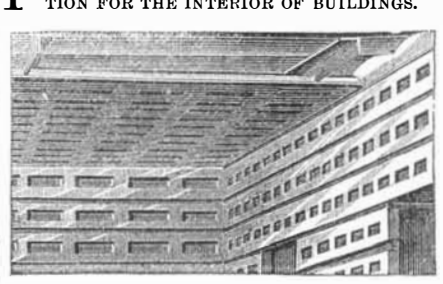

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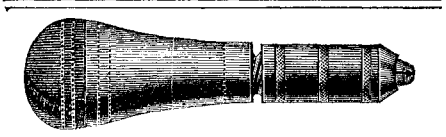

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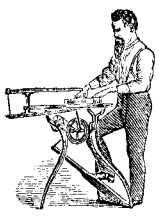

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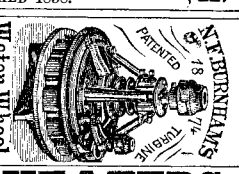


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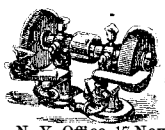

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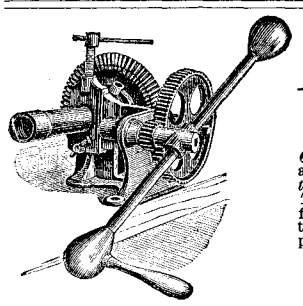

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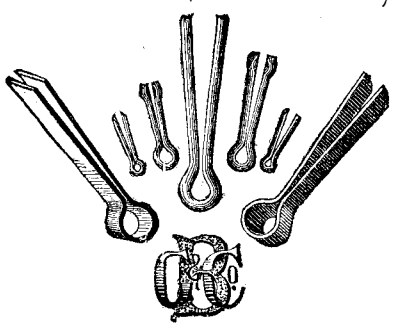

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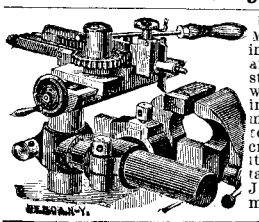

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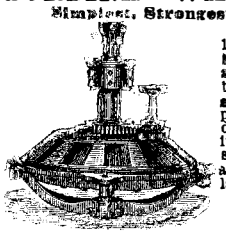

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